THE LITHICS OF AGANOA VILLAGE (AS-22-43), AMERICAN SAMOA: A TEST OF CHEMICAL CHARACTERIZATION AND SOURCING TUTUILAN TOOL-STONE

A Thesis

by

CHRISTOPHER THOMAS CREWS

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF ARTS

May 2008

Anthropology

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Approved by:

Chair of Committee,	Suzanne L. Eckert
Committee Members,	Ted Goebel
	Frederic Pearl
Head of Department,	Donny L. Hamilton

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ABSTRACT

The Lithics of Aganoa Village (AS-22-43), American Samoa:

A Test of Chemical Characterization

and Sourcing Tutuilan Tool-Stone. (May 2008)

Christopher Thomas Crews, B.A., Colorado College

Chair of Advisory Committee: Dr. Suzanne L. Eckert

The purpose of this thesis is to present the morphological and chemical analyses of the lithic assemblage recovered from Aganoa Village (AS-22-43), Tutuila Island, American Samoa. Implications were found that include the fact that Aganoa Village did not act as a lithic workshop, new types of tools that can be included in the Samoan tool kit, a possible change in subsistence strategies through time at the site, and the fact that five distinct, separate quarries were utilized at different stages through the full temporal span of residential activities at the village.

The assemblage was analyzed macroscopically using typologies for tools that are set and accepted by archaeologists of the area (Green and Davidson [1969] for adzes, Clark and Herdrich [1993] for flake tools). It was found that a possible new flake tool type is represented at Aganoa Village that combines the attributes of Class Ia and Class V. Analysis of the debitage refutes earlier conclusions that the site represents a lithic workshop. The presence of rejuvenation flakes with polish, a large amount of tertiary

debitage as opposed to primary debitage, and the recycling/conservation of finished adzes indicates that this site was indeed not a lithic workshop area.

In the earliest cultural period (c 2500-2000 years ago) there is a distinct lack of flake tool scrapers while the other two cultural periods presented 40 examples of such tools. These scrapers are used primarily for processing agricultural products. The fact that these tools are missing from the earliest settlement period suggests that these early inhabitants might have relied more on gathering marine resources from the nearby reef system rather then agricultural subsistence strategies.

Finally, INAA results show that the lithic artifacts collected come from five different sources. Two of these sources were identified as the Lau'agae Quarry on the eastern side of Tutuila Island and the Tataga-Matau Quarry Complex located on the western portion of the island. Three other basalt types were distinguished but not sourced or located.

DEDICATION

To Chief Chester and the Manaea Family,

current residents of Aganoa Village

ACKNOWLEDGEMENTS

I would like to thank my committee chair and mentor, Dr. Suzanne L. Eckert, for putting up with my random and constant questions and for guiding me through this experience. I also thank Dr. Frederic Pearl, without whom this thesis would not have been possible, and Dr. Ted Goebel, for educating me on how to tackle the lithic assemblage.

Thanks also to Philip Johnson for taking me under his wing in this endeavor; David Foxe for his endless help in the ChemChar Lab; Danny Welch for the drawings of the tools, listening and bouncing of ideas; Lowell Kane for just being his ambassador self; Megan Hawkins for listening to my rants; Andrew Roberts, whose support has been instrumental; Dr. William James and Mike Raulerson from the Chemical Characterization Laboratory, for their enthusiasm in this study.

Finally, I would like to thank my parents for their endless support and love. And, Rebecca Sager, for photos of the lithics and whose support, enthusiasm, and presence have bolstered me through this.

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CHAPTER I

INTRODUCTION

Tutuila Island, American Samoa, is a high volcanic island typical of Polynesia. Its igneous creation has resulted in the island having an abundance of exposed basalts, many of which are of a high-grade, fine-grained quality, the perfect type of basalt for the creation of adzes so prevalent in the prehistoric Samoan toolkit. The use of adzes ranged from felling trees to shaping logs to fashioning canoes. All of these activities wrapped around intricate ways of life in Samoa, from the clearing of plantation lands to erecting a *Fale O'o* (a ceremonial house structure of the Samoan *matai*) to the creation and decoration of the Polynesian canoe, the main mode of transportation of the ancestral Samoans. Known prehistoric quarries are found across the island but are not so plentiful that every village had immediate access to one. Many villagers in pre-colonial Samoa, such as those that lived at Aganoa Village, had to traverse the rugged terrain or travel by boat to gain access to a quarry. We do not yet unknown the amount of involvement the chiefs of villages with quarries had in the export and trade of lithic materials, although contact period accounts suggest that chiefs controlled some aspects of adze production (Hiroa 1930).

Many studies have been undertaken to analyze the source materials of various basalt tools throughout Oceania (Weisler and Woodhead 1995; Weisler and Kirch 1996;

This thesis follows the style of *American Antiquity*.

Weisler 1997, 1998; Di Piazza and Pearthree 2001). These studies have tried to garner answers about inter-island travel and trade of lithic material and, possibly, interactions between distinct island groups. Tutuila appears to have been prominent in such inter-island exchange in late prehistory. Artifacts found on other island archipelagos have been linked to the quarry of Tataga-Matau (Leach and Witter 1990). Few studies, however, have tried to make sense of lithic exchange and trade organization on a single island such as Tutuila (although see Lundblad et al. (*in press*) for current work in Hawaii as a notable exception).

This thesis is designed to identify what lithic raw material sources a small, Samoan village used in prehistoric times and to put forth a viable and testable model for intra-island control and exchange of lithic materials on the island of Tutuila before European contact. The model is based on an expanding sphere of exchange centering on Aganoa Village and growing through three cultural periods. This model is applicable to mid-level chiefdoms, especially those that rely on ocean travel as the primary form of transportation. Basalt samples were tested for their geochemical composition using Instrumental Neutron Activation Analysis (INAA) and the results are compared to those of a similar study of quarries on the eastern portion of Tutuila Island (Johnson et al. 2007). The materials tested were excavated from the small village of Aganoa located on the eastern side of Tutuila.

I propose and test a model for intra-island exchange and, as a result, control of lithic materials on the Samoan island of Tutuila. Tutuila Island is ideal for such a test. There are numerous sources of quality tool-stone on this relatively small island (Best et al. 1992). A villager in prehistoric times would not have had to travel far to find a source of fine-grained basalt that was ideal for the creation of adzes. This stone is difficult to work with, therefore, prehistoric Samoans used chipping and then grinding methods to shape their adzes. The stone preferred for creating unifacial scrapers, often referred to as coconut graters, however, appears to not be as specific as that used in the manufacture of adzes.

The excavation of Aganoa Village revealed the presence of distinct cultural phases. To analyze the lithic material temporally, the artifact assemblage was separated into three cultural periods based on relative dating methods. Cultural Period I is the only phase with associated radiocarbon dates. Cultural Period II is located above Cultural Period I and separated stratigraphically by 50-80 cm of sterile sand. This period is represented by deposits lying between 20 cm and 80 cm below the surface. Cultural Period III contains surface finds and those collected in the top 20 cm of the soil. This Cultural Period was separated to avoid contamination from bioturbation that would have occurred in the upper 20 cm of the plantation area and since a floor area was noted in Block O at about 20 cm below the surface.

The lithic assemblage from Aganoa Village (AG-22-43) was analyzed macroscopically, and a sample of it was analyzed using Instrumental Neutron Activation Analysis (INAA). Initial analysis included the use of current typologies for adzes and flake tools (Green and Davidson 1969; Clark and Herdrich 1993). All artifacts were measured for size, shape, and color. Each type of artifact, adze, flake tool, and debitage was measured for individual attributes associated with each group. An earlier survey b by Moore & Kennedy (2003) led them to conclude that Aganoa Village was a workshop for the creation of adzes. My research suggests this was not the case.

INAA was run on 90 samples of the lithic assemblage. The results were compared to those of an established database (Johnson et al. 2007). The results show that the villagers at Aganoa used five basalt quarries through the three cultural periods. Statistical analysis shows that the sources utilized by the villagers changed through time.

The implications of the results give further insight into the interactions of ancestral Samoans and their use of basalt tools. Using this research as a foundation, archaeologists will be able to study more aspects of craft specialization on the island of Tutuila.

CHAPTER II

ARCHAEOLOGY IN SAMOA

The Samoan Archipelago lies south of the equator on a nearly straight line between New Zealand and the Hawaiian Islands at approximately 14˚ S Latitude and 170˚ W Longitude (Figure 2.1). It lies in the eastern portion of what is considered Polynesia. It was created by hotspot shield volcanoes (Natland 1980; MacDougall 1985). The archipelago is currently divided into two countries. Samoa, or Western Samoa, has been an independent state since 1948 (Davidson 1967). Samoa is made up of the two largest islands in the archipelago, Upolu and Savaii. The other islands of the chain, including Tutuila and the Manu'a Group (Figure 2.2), are a territory of the United States of America.

Archaeological interest in Samoa is relatively young in comparison not only with areas such as Europe and South America but also Pacific Oceania. More emphasis in the Pacific has been placed on researching the rapid Lapita expansion (Kennedy 1981; Kirch 1987, 1996; Smith 1995), the Moai of Rapa Nui (Beasley 1923; Pollock 1985; Van Tilburg & Lee 1987), and the islands of Hawaii (Cordy and Kaschko 1980; Tuggle and Tomonari-Tuggle 1980; Ladefoged and Graves 2000). Prior to 1960, anthropological work in Samoa centered on ethnography and ethnoarchaeology. During this time Margaret Mead (1928) made national headlines with her book *Coming of Age in Samoa*.

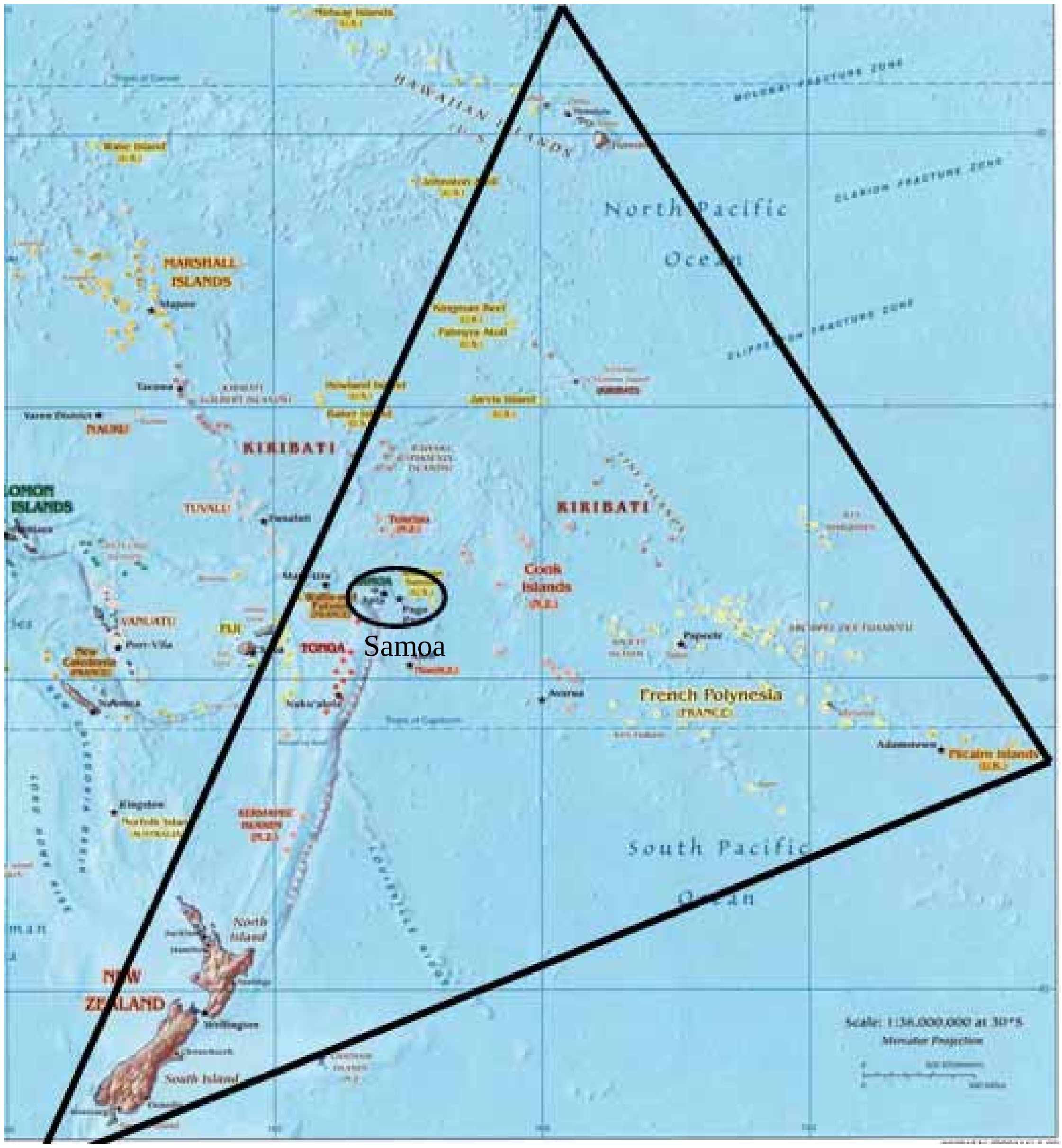

Figure 2.1. The Polynesia Triangle (modified from www.flickr.com).

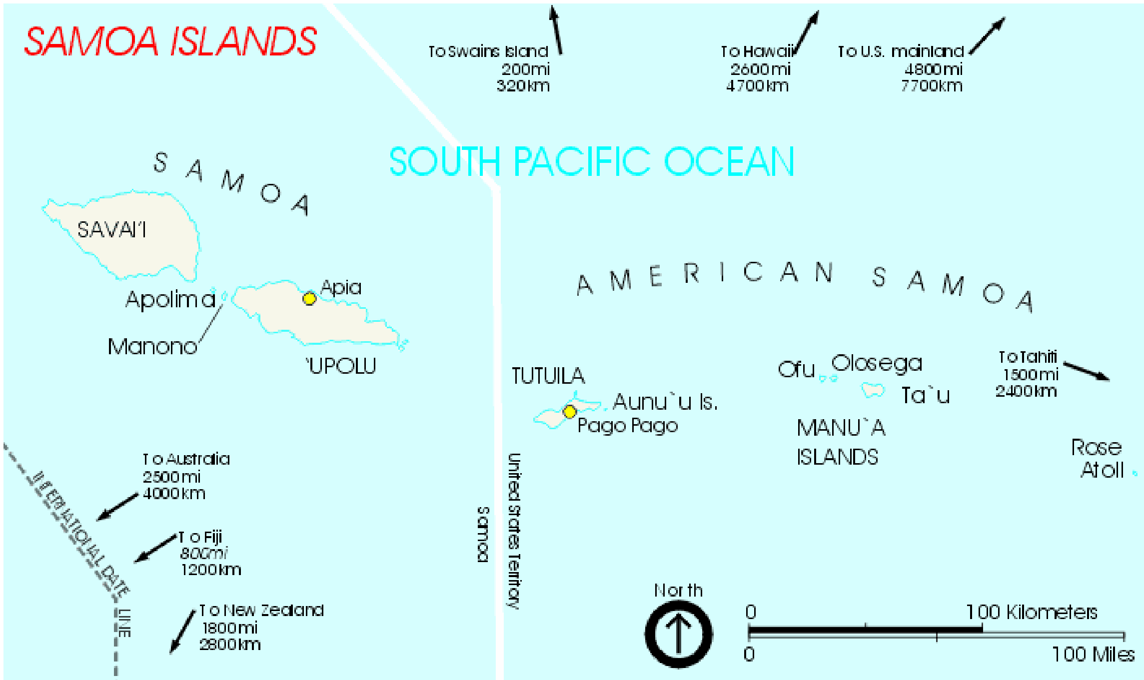

Figure 2.2. The Samoan Archipelago (Modified from http://www.samoanet.com).

Lesser known to the lay public, Peter Buck, also known as Te Rangi Hiroa, wrote about the material culture of the Samoans including stone tools in 1930 (Hiroa 1930). Samoa was also included in works spanning Polynesia, such as that by Williamson (1927). From 1960 to 1990 archaeological interest in Samoa rose thanks in large part to the comprehensive works coordinated by Green and Davidson (1969, 1974) on the islands of Western Samoa. Discoveries such as decorated Lapita ceramic sherds in the Mulifanua ferry berth brought Samoa into the Lapita discussion (Jennings 1974). Excavations at the Tataga-Matau Quarry (Leach and Witter 1985, 1990) revealed a complex lithic industry on the island of Tutuila. Since 1990 archaeological excavations recovered artifacts from sites such as To'aga (Kirch et al. 1989a, 1989b), 'Aoa (Clark and Michlovic 1996), Alega (Clark 1992), and Aganoa (Moore and Kennedy 2003; Eckert 2006, 2007; Crews 2007; Kane 2007), increased the archaeological knowledge of the Samoan Archipelago and the archaeologists are working together to further the understanding of the prehistory of the area.

Pre-1960: Ethnography and Ethnoarchaeology

After initial European contact in the 18th century, the Samoan Islands remained fairly undisturbed by European influence. In the 1830's the first Western Christian missions were established and Christianity started to alter the Samoan way of life..

At this point in time the recording of Samoan myths and legends was carried out by missionaries and travelers. The establishment of the Polynesian Society and subsequent publication of their journal, *The Journal of the Polynesian Society*, in 1892, brought these stories of ancestral Samoa and other topics to people all over the world. Authors such as Fraser (1902a, 1902b), Macdonald (1904), Churchill (1905, 1906, 1908a, 1908b, 1908c), and Ray (1912a, 1912b) published linguistic articles exploring the Samoan language. Tregear (1902, 1904), Schultz (1909, 1911) and Nelson (1925) shared Samoan legends through the journal. Other anthropological papers included James' "Pathology of Samoa" (1913), Sullivan's "Racial Diversity of the Polynesian People" (1923), Linton's examination of the use of human figures in art (1924), and Thompson's article covering the earthmounds found on the islands (1927).

In 1924 Williamson published a three volume set entitled *Social and Political Systems of Central Polynesia*. This compilation puts forth an in-depth look at the political systems found throughout Central Polynesia. Williamson presents the first view of the intimate workings of the Samoan chiefdom and compares it with other political systems in Polynesia. This work proved to be highly important in many ways. It served as a source for those about to study anthropology in Samoa and also drew in the interest of those studying chiefdoms throughout the world.

In 1958 Sahlins published a monograph that had enormous influence on the study of chiefdoms worldwide. *Social Stratification in Polynesia* gave a detailed description of the chiefdoms found in Polynesia. It covered the polity, both past and present, of eight major island groups. Sahlins split these eight island groups into three categories based on social complexity and the "degree of stratification within each society" (Sahlins 1958:10). Samoa was grouped with neighboring Tonga, highly stratified Hawaii, and the Society Islands in the top group of the hierarchical chain. Sahlins detailed the intricacies of the Samoan chiefdom, from *matais* and *ali'i* to the economic implications of each position with relation to those with or without lower titles.

Many authors have followed Williamson's and Sahlins' work with similar but more detailed studies (Davidson 1967; Huntsman 1995). It is in these readings that the complexity of the Samoan chiefdom became evident. They reveal the many levels of title including the heads of each family group and how they are incorporated on the village level, with the high chief being the most influential. Further, they detail how the high chiefs are then involved in inter-village gatherings with the highest ranking chief among them claiming the most powerful position. (Keesing et al. 1956; Kallen 1982).

Sahlin's (1958) work is still used today as a reference study into the functioning systems of chiefdoms throughout the world. While these works are extremely important to the study of Polynesian chiefdoms, it is Hiroa's work *Samoan Material Culture* (1930) that created a reference for archaeologists to turn to when confronting a question regarding any aspect of Samoan material culture.

Hiroa (who sometimes published under Buck 1930) provided anthropologists with the first synthesis of lithic tool types (Buck et al. 1930) in Polynesia. A similar typology appears in his book (Hiroa 1930). There Buck offers two typologies of Samoan stone tools. One is a typology of adzes; the other considers scrapers and other efficient tools such as blades (Hiroa 1930). *Samoan Material Culture* shortly became a very important book that encompassed details including construction of houses and boats, the use of stone tools, fishing techniques, and customs involving a wealth of different possessions of early Samoans. Buck's publication shows archaeologists step by step methods of how boats were made and how an adze was hafted depending on type and intended use to name a few specifics.

Meanwhile, Margaret Mead was fast becoming a famous cultural anthropologist and making Samoa popular with her now questioned book *Coming of Age in Samoa: A Psychological Study of Primitive Youth for Western Civilization* (1928). Despite the continued discussion around Mead's work archaeological curiosity and research appeared to wane after Peter Buck's work in the area. More emphasis was placed upon the cultural perspective of contemporary Samoans.

These early ethnographic works provided a solid base for future archaeological studies. They provided detailed information on the chiefdom in practice after European contact, crafts such as bark cloth, and tools such as adzes used in Samoa. This information can be used as a starting point for archaeologists. This information, however, must be accepted with caution. What is recorded in these writings is a picture of the present with oral stories of the past. There is a good probability that the form of the chiefdom changed after the intrusion of Christian missionaries and the conversion of the Samoans, not to mention the probable changes through more than 2000 years of prehistory.

1960-1990: Settlement Patterns and the Beginning of Scientific Excavation

In the early 1960's, Kikuchi (1963) completed his Master of Arts thesis for the University of Hawaii at Manoa survey presenting the results on surface ruins in American Samoa. This research identified dozens of locations that have potential as archaeological sites. Kikuchi did not limit himself to prehistoric sites but included historic sites such as gun posts from World War II.

Shortly after this, the islands of independent Western Samoa received much of the archaeological interest in the archipelago. Most of the early studies of archaeology in Samoa were centralized in the larger islands of Upolu and Savai'i that make up the bulk of Western Samoa (Green and Davison 1969, 1974; Jennings 1976). In the late 1960's, archaeologists began systematic surveys and excavations on the two largest Samoan Islands, Upolu and Savai'i. The largest publications to date focusing solely on the archaeology of Samoa are the two volumes entitled *Archaeology of Western Samoa, Volumes I and II* edited by Green and Davison (1969, 1974). These publications covered multiple excavations and surveys executed on the islands of Western Samoa. Under Green's direction, the excavations sampled a wide variety of sites in an effort to better understand the settlement patterns of the ancestral Samoans. Green and Davidson (1969, 1974) brought to light the largest amount of continuous and coordinated research on Samoan prehistory. Using the settlement pattern approach, the detailed work included 40 reports from surveys and excavations on the two largest islands.

Green and Davidson (1969) present the second typology of adzes found in Samoa. This typology is based on the initial Samoan adze typology by Buck (Hiroa 1930). Both of these classification systems are based on morphology, since the Samoan names for different types of adzes and the functions for which they were intended has been lost. Previous attempts had been made to classify adzes from Polynesia as a whole or a combination of island groups (Duff 1956, 1959; Emory 1968), but only Buck (Hiroa 1930) had devised one for just the Samoan Archipelago. After explaining the morphological components of each type of adze, Green and Davidson (1969, 1974) attempted to place a chronological perspective on the new typology. The difficulty came with the fact that most of the assemblages they viewed were surface collections.

In sum, all the types except VIII and IX appear to be present at early levels, either in forms identical to, or closely relater to adzes in the surface collection. Of the types which were apparently common in later times, Type III and Type VI are identical in early and late contexts, while Types I and II tend to be represented at earlier levels by smaller, related but not always identical forms, which could probably be identified as varieties of these types. In a few cases differences between early and late examples of these types, however, are probably partly due to the weathered state of early specimens, which blurs distinctions between front and sides, and between flaked and ground surfaces.

The rarer types in surface collections, IV, V, VII and X are all known from early levels and only Type VIII is uncertainly placed. Their presence in the surface collection from a given locality, therefore, may suggest a somewhat earlier site than would a preponderance of Types I, II and IX, for instance. At present, however, we do not feel our knowledge of the sequence is sufficient to make any closer identifications of the age of sites solely on the basis of adzes found on their surface (Green and Davidson 1969).

As part of the massive survey collections in "Archaeology of Western Samoa", the now famous site of Mulifanua was first mentioned (Dickinson 1974; Green 1974; Jennings 1974). In 1973 a canal was dredged through the underwater coral formations near the land site of Mulifanua. Within the dredge-waste was found highly decorated pottery sherds. It was determined that these sherds were examples of the dentated Lapita pottery bringing Samoa into the discussion of the origins and spread of the initial population of the remote Pacific Ocean. It was previously believed that the makers of Lapita pottery who had settled parts of Melanesia and Micronesia stopped their expansion at Tonga and Fiji (Kirch 1996). The temper in sherds from Mulifanua were tested for their source and it was found that they are indeed not local as opposed to most of the undecorated pottery usually found in Samoa (Dickinson 1974). This new evidence brought more prestige to Samoan archaeology, involving it with the largest debate at the time, the expansion of Lapita.

Green and Davidson (1974) created a Samoan timeline based on 45 radiocarbon dates. Their results showed that settlement of Samoa as evidenced by Eastern Lapita Pottery occurred "around or before 800 B.C." (Green and Davidson 1974:224). Evidence, including locally made pottery, suggested continued use of ceramics through the third century A.D. Inland expansion and settlement was thought to have occurred between 100 B.C. and 500 A.D. Green and Davidson concluded that mounds for houses and other functions were built "at some point after the tenth or eleventh centuries A.D." (1974:224). From the eleventh and twelfth centuries A.D. all zones were occupied until the 1830's. Green and Davidson claimed that Samoa's main feature through time was its continuity of artifacts. Changes in pottery and adze form occurred early. Pottery was discontinued after 1000 years of occupation. Adze forms changed little in form after the initial changes.

Settlement patterns were a primary concern in the extensive surveys and excavations. Davidson (1974) concluded that the first settlers lived near the coast and cultivated the lands nearest them. It is uncertain whether the first settlers of Samoa practiced agriculture or had a subsistence strategy based on gathering from present flora and marine resources. What is clear is that agriculture was practiced shortly after colonization. As populations increased, the land would have been exhausted and lands further inland would have been utilized. Earthwork fortifications have been present in Samoa for about 1500 years as a response to warfare. After European colonization, coastal settlements became more desirable as an easy way to contact Europeans (Davidson 1974).

The changing aspect of travel with the improvement of commercial flights brought Samoa closer to the rest of the world. Access was not so restricted to those that could afford and handle the long travel. This increase in tourist travel brought up important concerns of the conservation of prehistoric Samoan sites. One example of this is the excavation of Olovalu Crater on Tutuila Island, American Samoa. The governor just prior to 1970, John Haydon, recognized this need to preserve the archaeological and natural resources of the island. The excavation was carried out in response to the continued and accelerated development of American Samoa. The findings indicated that Olovalu crater held much in the way of archaeological implications (Ladd and Morris 1970). Unfortunately, no more work has been done in the crater to date.

And so goes much of Samoan archaeology. Most of the current literature is in the form of site and survey reports. Publishing in Samoa is slow in coming at times but the interest continues to grow and the number and frequency of publications in journals are increasing.

Archaeology witnessed the analysis and reporting of two important sites in American Samoa (Figure 2.3) in the 1980's. The excavation of To'aga, Ofu Island, by Kirch and Hunt brought the study of ceramics and the implications of the presence of decorated ware to the forefront of archaeological study in Samoa (Kirch and Hunt 1989a, 1989b). Meanwhile, the survey and excavation of the Tataga-Matau quarry located near the Tafuna plain brought to light the intensity at which the prehistoric inhabitants of Tutuila utilized the natural raw lithic materials abundant on the island (Leach n.d., 1990).

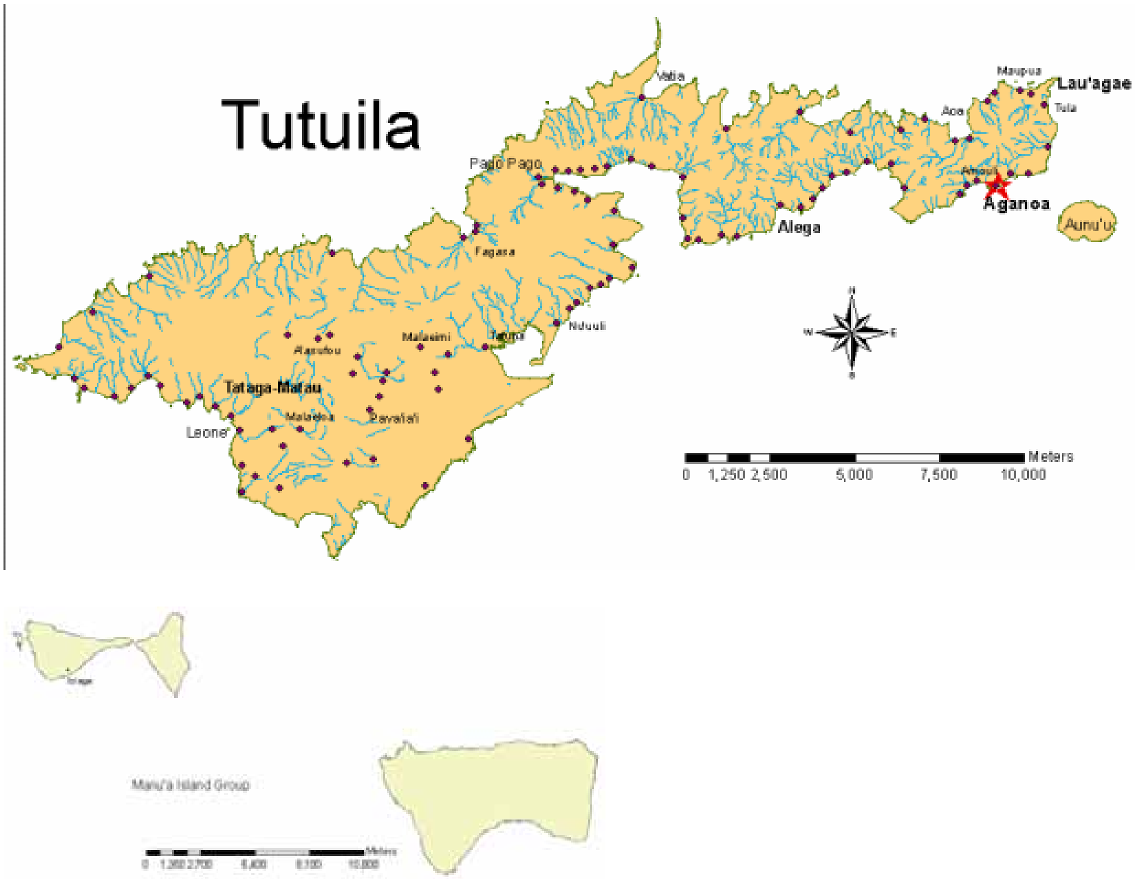

Figure 2.3. Map of American Samoa showing location of major towns and archaeological sites. Three sites discussed in text. Manu'a Group not to scale, lies to the east of Tutuila.

To’aga produced relatively few lithic samples. In fact, a majority of the debitage was intentionally not collected during the excavation (P. Kirch, personal communication 2005). However, it is an important site for the study of ceramics on the archipelago. The sherds recovered showed decoration that was not as intricate as that of Lapita, however there are far more decorations than the few impressed dentations along rims that are found elsewhere on the islands. These sherds were labeled “Lapitoid” by Kirch and Hunt (1989a).

To’aga proved useful in the discussion of the temporal sequence of Samoa. Radiocarbon dates showed that this site was utilized for the duration of the Samoan sequence. In fact, the earliest deposits dated to 3700-3300 years before the present (BP). This is considerably earlier than the dates put forth by Green and Davidson (1974). Polynesian Plainware is noted between 2500-1900 BP. Deposits not containing ceramics dated after 1900 BP. The data for the earliest ceramics are insufficient for a confident claim of this being a Lapita occupation, though the dates coincide with dates from other Lapita sites including Mulifanua in Western Samoa and in Tonga and Fiji (Kirch et al. 1989a, 1989b).

Tataga-Matau is a massive quarry site on the western part of Tutuila. It is clear that the site was used systematically by accomplished adze makers (Leach and Witter 1985, 1990). The quarry is located just upland from the coastal site of Leone, where one can find hundreds of circular and oval depressions in solid, basalt bedrock. It was once used as a polishing area where performs of adzes where brought for finishing touches. This site is buffeted by waves that supply a constant source of water necessary for the grinding activities that took place there. Some have thought that it also acted as a market for the completed adzes where customers could row up to the formation in their boats and procure what was necessary (F. Pearl, personal communication 2006).

The Tataga-Matau Quarry was surveyed in the mid 1980's. It covers a large area of a ridge. Buck mentioned it in his 1930 publication *Samoan Material Culture.* Leach and Witter (1985) included in their final report a step by step description of the creation of an adze based on experimental archaeology and the types of debitage found at the site. This material is very important to researchers studying adzes and debitage as a result of adze manufacture.

Further investigations in 1988 provided a temporal element and showed that the site expanded beyond their 1985 survey to include three major quarry areas (Leach and Witter 1990). It was concluded that the quarries were in use from the 11th century A.D. to the end of the prehistoric period around 1830. Evidence of human actions indicated a period of intense, "organized industrial activity" (Leach and Witter 1990:81) between the 14th and 16th centuries A.D. This quarry represents the largest, organized effort to prepare adzes and preforms on Tutuila. It is possible that another quarry might rival Tataga-Matau in scale, but none has been reported at this time.

Also during the 1980's, the American Samoan Power Authority (ASPA) set up an archaeological unit to complete survey works before the installation of pipelines and roads. The American Samoa Historical Preservation Office (ASHPO) also added archaeological management, sponsoring various excavations of the islands of American Samoa.

The archaeological investigations performed before 1990 are a baseline upon which much of the most recent archaeological research in the region is based. The ideas and hypotheses presented during this time have formulated much of the archaeological research done in the past 10 years. These results gave archaeologists a further knowledge of a Samoan timeline. Important sites have been explored and reported. The knowledge that Samoa should be included in the discussions of Lapita pottery came to the forefront during this period. Meanwhile, evidence on the importance of Tutuila as a source of tool-stone came to light and have been the focus of many studies since.

1990-Present: The State of Archaeology in Samoa Today

The 1990's to the present has witnessed a much more concentrated approach to the timeline of Samoan prehistory (Table 2.1) and the use of chemical properties to locate the sources of stone tools found at archaeological sites. Samoa has been included in many Pan-Pacific and Pan-Polynesian publications as the origin of the Polynesian people (Kirch 2000, Kirch and Green 2001). Other archaeologists have concentrated efforts along the lines being followed elsewhere in Polynesia concerning Neutron Activation Analysis (NAA) and X-Ray Flourescence (XRF) analzses. These methods have been used effectively by Weisler and his associates (Weisler 1997, 1998, Weisler and Kirch 1996, Weisler and Woodhead 1995). These studies were used to provide a clearer picture of inter-island communication and trade of stone tools.

Table 2.1. The Samoan Cultural Chronology

Period	Date Range	Settlement Pattern	Material Traits
Ceramic Periods			
Early Eastern Lapita	3100-2700 BP	Initial settlements along coast	Early Eastern Lapita decorated pottery, Adze types I, possibly III, IV, V
Late Eastern Lapita	2700-2300 BP	Coastal settlements	Late Eastern Lapita decorated pottery, Adze types I, possibly III, IV, V, IX, X
Polynesian Plainware	2300-1700 BP	Coastal and inland settlements	Undecorated pottery, Adze types II and IV (as well as earlier forms)
Aceramic Periods			
Dark Ages[1]	1700-1000 BP	Coastal and inland settlements	Absence of pottery, Adze types VII and VIII
Recent	1000-250 BP	Inland settlements; monumental architecture including fortifications and star mounds	Absence of pottery, Adze types VII and VIII
Historic	250 BP-present	Coastal and inland settlements	Absence of pottery and stone adzes, metal nails, glass beads, other artifacts of European origins

In 1992, the valley near Alega, Tutuila, was surveyed as a quarry/workshop site (Clark 1992). Surveys revealed the presence of at least 14 sites in the valley. Artifacts were collected from four of the sites. The area was occupied sometime before the 14th century A.D. Investigations provided no basis for thinking that the area was settled early in the Samoan sequence.

Excavations in the area showed a shallow depositional state of artifacts. The oldest culturally active layer was Layer II dating just prior to the 14th century. Artifact comparisons by level led Clark (1992) to the conclusion that the earliest residents did not make tools as intensively as later residents. Unfortunately, conclusions for a temporal element of the site proved difficult to come by due to the presence of abundant surface finds and little deposition taking place in the area. Excavations, however, produced a large quantity of lithic artifacts. There is little of the parent material readily noticed above the surface, as is the case with many quarries on the island including the unexcavated Lau’agae Quarry on the eastern end of Tutuila. Clark hypothesized that the manufacturers were using large cobbles of basalt that can be easily found as the source of blanks for adzes. What is currently found there is the remains of worked basalt cobbles before the cobbles were exhausted.

Clark (1992) did run some geochemical tests on two flakes from the Alega region. He did this in an effort to add to a growing dataset of possible Tutuilan quarries. While the intention was understandable, a sample size of two flakes did not provide enough data for statistical analysis.

Jeffrey Clark, in association with American Samoa Historic Preservation Office (ASHPO), excavated ‘Aoa, Tutuila in 1995. It was chosen for having ceramics in hopes to further the understanding of the early components of the Samoan timeline, the ceramic periods that lasted at least 1000 years (Kirch et al 1989a, 1989b). The site proved fruitful producing hundreds of ceramic sherds, some with decorated rims. The lithics found were typical of what one would find at a village site in Samoa consisting of a few complete adzes, multiple adze fragments, and many more scrapers (Clark & Michlovic 1996).

The occupation of highland sites was investigated by a team led by Pearl (2004). He surveyed and mapped multiple sites in more mountainous regions of Tutuila. The findings indicate that the elevated portions of Tutuila were settled in a small window of time around 650 BP (Pearl 2004).

Johnson (Johnson et al. 2007) sampled various quarries on the eastern portion of Tutuila. Using NAA, they identified the chemical differences of separate quarries, thus allowing future work analyzing the NAA data from village sites (Johnson et al. 2007). It is this data set that will be compared to the NAA results form Aganoa, allowing us to see from where these ancestral villagers procured their stone tools.

The wealth of archaeological investigations that have come to light in recent years is beginning to synthesize what has already been done. Clarifying questions that were unanswerable in the 1960's and 1970's is a clear path available to archaeologists. The previous work done before this thesis supports the need for such a project. While the Samoan sequence is being perfected, research into intra-island trade of lithic materials will help to understand the interaction of various villages on Tutuila and the Samoan Archipelago as a whole.

As archaeological interest in Samoa continues to grow more research will make the timeline of Samoa much clearer as can be seen with current research. There is not much standing the way of future archaeologists on the archipelago. Many questions remain unanswered and with a lack of previous research there are few early ideas that need to be reversed or revised which should allow Samoan archaeology to grow smoothly into the future.

CHAPTER III

THE EXCAVATION AT AGANOA VILLAGE (AS-22-43)

The site located at the small village of Aganoa was excavated in the summer of 2006 by a team from Texas A&M University, College Station and Texas A&M University, Galveston. Principal Investigators, Pearl and Eckert, chose this area to excavate after a survey and test excavations revealed a high amount of ceramic and lithic artifacts (Moore and Kennedy 2003). The presence of pottery indicated that this could be one of the earlier sites of Samoa.

The primary tool-stone used in Samoa is fine-grained basalt. The bulk of the tools found in Samoan assemblages are adzes of various sizes and shapes, and scrapers, often known as coconut graters (Green and Davidson 1969, 1974). There is very little discussion of blade technology on the islands as compared to that on mainland America, but evidence is emerging that this technology was utilized by ancestral Samoans (Hawkins 2008).

When Moore and Kennedy (2003) excavated Aganoa Village in 1999, they argued that this site could be a workshop area for the manufacturing of adzes. Their finds included a high frequency of cortical debitage, which is often a sign of tool manufacture. However, the artifacts recovered during the 2006 excavation show a low amount of cortical debitage. One would expect a high frequency of primary (cortical) debitage at a workshop site and little to no cortical debitage at a residential site since the adzes would have been imported after manufacture. The site of Alega is a good example of this. Clark (1992) recovered 89 pieces of primary debitage and 159 pieces of secondary debitage. Aganoa Village, on the other hand, appears to have been primarily a residential village in which the lithics used were at times reworked after a break and expedient tools were sometimes made from nearby cobbles.

Location

The modern village of Aganoa is a small hamlet, and a part of the village of Amouli, located on the southeastern side of the island of Tutuila, American Samoa. Aganoa currently has two houses, one belonging to the head family, the Manaea's, one large bathroom facility, and a *fale o'o,* an open-air structure intended for guest use. The main road of the island runs parallel with the shore separating the house area from a wide, straight beach (Figure 3.1).

The southerly-facing valley is shaped by two spurs that jut off from Olomoana Mountain at the rear of the valley to the north. Before the creation of the road, these spurs jutted into the ocean, heavily impeding overland travel to the area. Behind the modern houses is a plantation area consisting of breadfruit (*ulu)* trees, banana trees, coconut palms, taro plants, and an old pigpen (*pa pua'a*). This plantation area is where the bulk of the excavation units in 2006 were placed (Figure 3.1).

Geoarchaeology has shown that the current beach is flatter and further down valley than it was in prehistoric times (Sauck et al. 2007). Sterile sands were found at or around 60 cm below the surface in a majority of the units. Two excavation blocks (C and L) revealed early occupation areas roughly 150 cm below the surface along an old

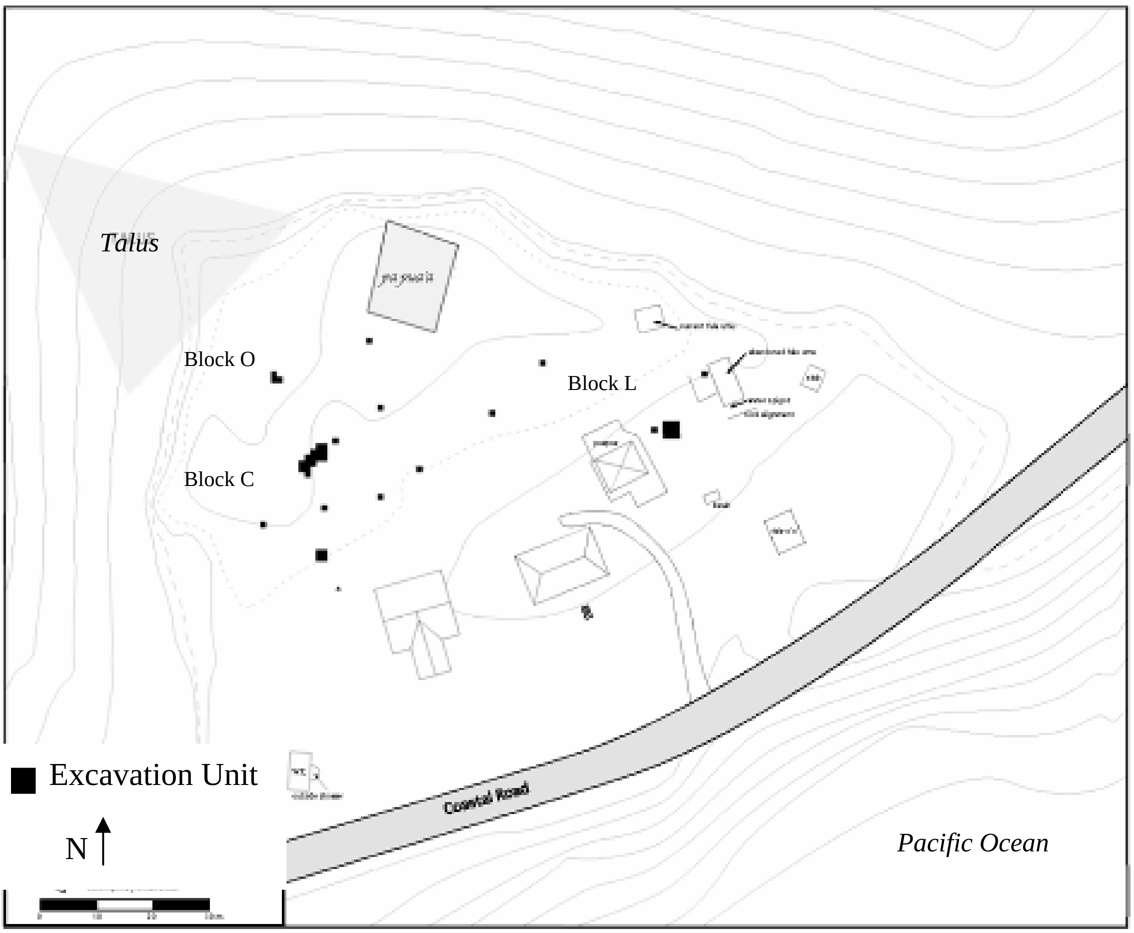

Fig. 3.1. Aganoa Village with excavation units in place. Map made by F. Pearl.

beach berm that is still evident today as a slight rise then fall in elevation parallel with the shoreline. This berm is located around 20 m inland from the current beach.

Excavation

Most of the units were excavated in 1 m squares. One 2 x 2 m block (Block C) was opened along with a 3 x 3 m block (Block L) and a large aerial exposure (Block O) exposing 16 m^2. Most 1 m^2 units were excavated to a depth 150 cm below the surface. Block A was excavated to 2 m below the surface. A depth over 3 m was reached in Block L. Block O (Figure 3.2) was excavated with the purpose of exposing a 3 x 3 m area of an old floor that was around 20 cm below the surface (Figure 3.3). It was expanded to a total of 16 units to expose three postholes and a floor made of *ili'ili*, a foundation of coral and rock cobbles and pebbles. Very few lithics, tools or debitage, were recovered from this area. This makes sense as household floors were usually kept very clean.

Blocks C and L exposed layers of occupation from the surface to 40 cm to 60 cm below the surface. At around 160 cm below the surface another cultural layer in each block was discovered. These were marked by large amounts of lithics and ceramics (Figure 3.4). The area between the cultural layers was sterile, coarse, poorly sorted sand. Block C uncovered this cultural layer during excavation, while it was first noted in Block L as an anomaly during survey with ground-penetrating radar and a magnetometer along the old burm. This remote survey revealed an area that was more densely packed than that above it. The results, however, were inconclusive as to whether it was indeed a cultural layer like that previously found in Block C, or just a dense patch of sand and rock. Subsequent excavation revealed it to be the oldest cultural layer discovered on the island.

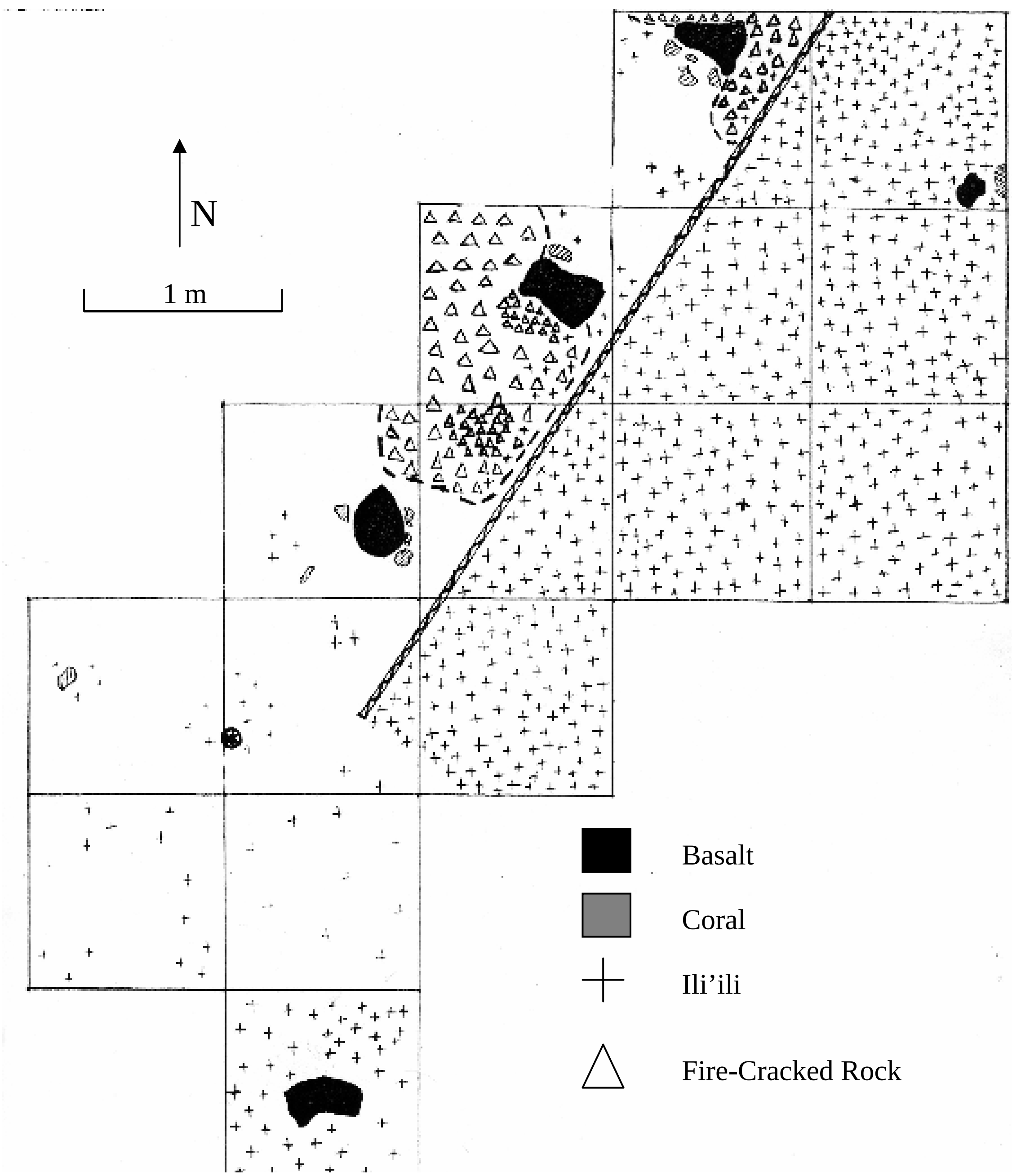

Figure 3.2. Planview of Block O. The profile is shown in Figure 3.3.

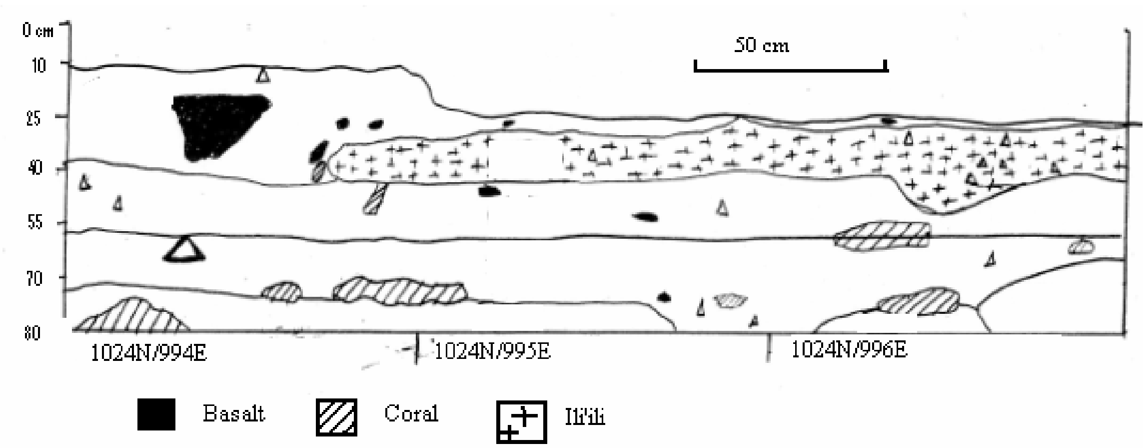

Fig. 3.3. Profile of trench excavated in Block O.

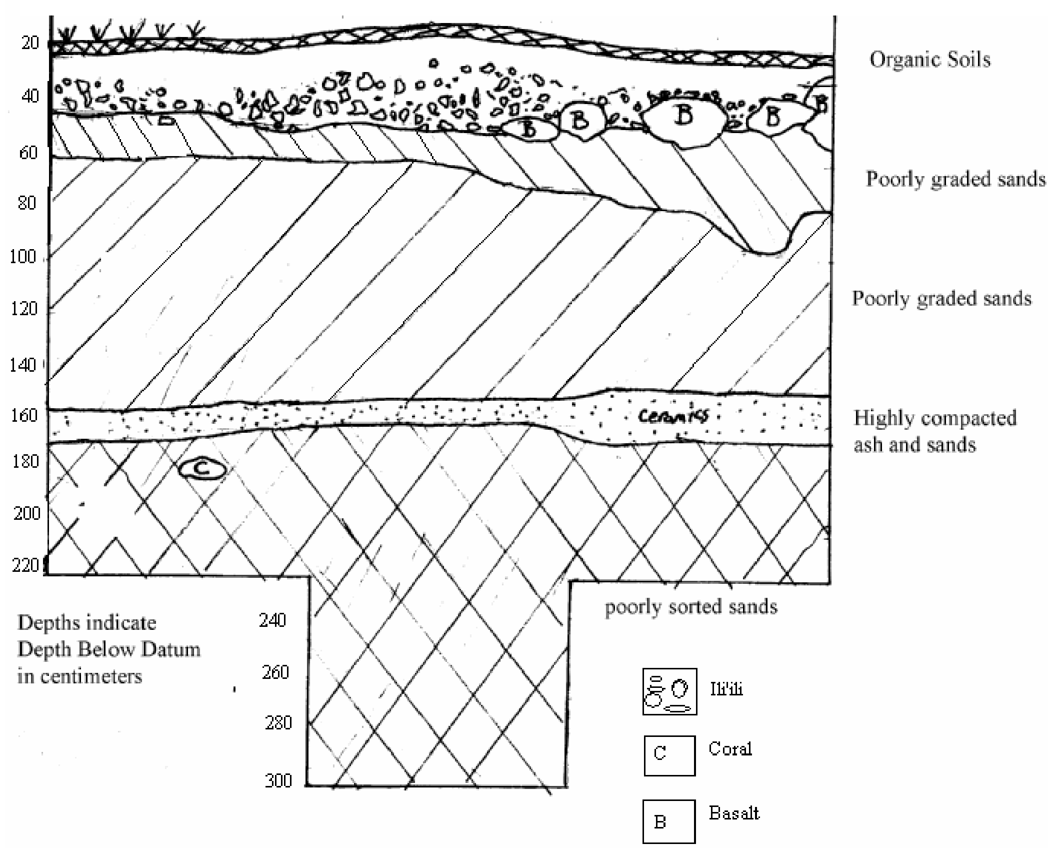

Figure 3.4. Profile of west wall of Block L.

Fourteen radiocarbon (^{14}C) samples were sent to be dated at Beta. The ^{14}C results show that the cultural layer in Block C was the oldest at the site (Table 2.1). The oldest calibrated date of 2570 ± 40 BP was located in level 12 of unit 1006N/997E, the southeast quadrant of Block C. Other dates identify an old age for the lower cultural layer of Block L (Table 3.1). The earliest date reported was 1260 ± 40 BP from a sample in level 4 of unit 1029N/1058E of Block L. All 14 samples were taken from either Block C or L.

Table 3.1: Radiocarbon Dates Returned from Aganoa Village Including Cultural Period Association.

Sample	Unit	Depth (cm)	Measured BP	Calibrated BP	Block	Cultural Period
FS942	1029/1058	160	2340 ± 40	2320-240	L	I
FS981	1028/1058	167	2300 ± 40	2280-2360	L	I
FS986A	1029/1059	160	2170 ± 40	2140-2220	L	I
FS1019A	1028/1059	157	2280 ± 40	2260-2340	L	I
FS1019B	1028/1059	157	2330 ± 40	2250-2330	L	I
O392	1006/997	150	2570 ± 40	2460-2540	C	I
O398	1006/997	155	2590 ± 40	2500-2580	C	I
O691	1029/1058	50	1260 ± 40	1220-1300	L	II
O831	1028/1059	120	2220 ± 40	2140-2220	L	I
1074	1029/1060	172	2230 ± 40	2170-2250	L	I
0986B	1029/1059	158	2130 ± 40	2110-2190	L	I
218273	1006/996	135	2530 ± 40	2490-2570	C	I
218274	1007/996	75	2070 ± 40	2030-2110	C	I
381	1006/997	136	2540 ± 40	2530-2610	C	I

For the purpose of this analysis three cultural periods were assumed. These were put into place based on relative stratigraphy. We currently do not know if Cultural Periods II and III constitute distinct cultural layers. Cultural Period I is represented by the lower portions of blocks C and L and is the location from which the radiocarbon samples were procured. The two different blocks could represent two distinct occupational periods, but, for the purposes of this research they were combinded into one cultural group. Cultural Period II is defined by deposits at a depth of 20 cm to 80 cm below the surface and can be found in all the excavation units. It is separated geologically from Cultural Period I by 80-100 cm of sterile sand. Cultural Period III includes artifacts from the surface and from above 20 cm below the surface. This cultural period was marked in order to avoid disturbances from actions such as bioturbation and plant root growth. It was also noticed that the presence of pottery waned in these levels indicating later occupation.

One surface collection extending from a 1 m dog leash around a datum revealed a large number of debitage and two tools. This area was not excavated below the exposure of the soils underneath the *ili'ili* covered ground. This was an interesting manufacturing area that was not reproduced anywhere else on site. It is possible that Kennedy and Moore (2003) had noticed areas such as this, and thus concluded that Aganoa might have been a manufacturing site. Lithic collections such as this do not exist at any level below the surface. If Aganoa was indeed used as a workshop site, it occurred recently and does not appear to have been practiced earlier.

CHAPTER IV

THE LITHIC ASSEMBLAGE

The excavation at Aganoa Village recovered 20 adzes or bifacially flaked tools, 40 flake tools, 1445 pieces of debitage and smooth rocks, and some other miscellaneous stones of an undetermined function.

The lithic materials recovered were basalt and obsidian. The tools found were all made of basalt. The obsidian accounted for only 1% of the assemblage (n=150) with few pieces larger than 1 cm^2. The obsidian artifacts recovered are being analyzed by Welch of Texas A&M University, who reports that much of the obsidian is too small to analyze macroscopically beyond the identification of flake scars and percussion points (D. Welch, personnal communication 2007).

The excavation recovered four complete adzes and 13 adze fragments or reworked adzes. Three cores and a rounded, triangular-shaped stone similar to an adze with evident usewear were recovered. Also, a sphere of vesicular basalt was found. The use for this artifact is unknown, but similar finds at Alega (Clark and Michlovic 1996) were thought to be weights for nets for either fishing or pigeon netting. The assemblage also proved wealthy in flake tools (n=40). Most of these tools are unifacial. The majority of the identified flake tools were scrapers with one classified chisel and one bifacially flaked scraper. These tools will now be referred to as scrapers as it is not a requirement for scrapers to be unifacial.

The adzes recovered from Aganoa were classified according to Green and Davidson's (1969) typology (Table 4.1). Clark and Herdrich (1993) set up the typology for flake tools that was used. In this system there are ten classes with some split into subclasses. Most classes matched up well with the Aganoa assemblage with some exceptions. Neither of these typologies deals with a temporal element. The continuity of Samoan artifacts currently infringes upon the creation of a temporal tool classification. Most changes in the Samoan tool kit occurred early, after which only subtle changes in the lithic artifacts can be accounted.

Table 4.1: The Criteria for the Classification of Adzes (Green & Davidson 1969).

Flaked and partially ground finish								Fully ground finish	
Quadrangular cross-section			Rounded		Triangular			Quadrangular section	
Back > front		Front > back	Back flat		Apex up	Apex down		Back > Front	
Thin	Thick	Thin	Thin	Thick				Thin	Thick
I II[1]	IX	IV	Va	Vb	VI VII[2]	VIII		III	X

[1]further distinguished by median ridge on back.
[2]further distinguished by consistently greater thickness in relationship to width of cross-section.

Adze Analysis

Each adze or adze fragment was measured for its weight, max length, distal width, proximal width, presence of absence of cortex, Munsell color, and estimated percent of total area with polish (Appendix A). These measurements inform on morphology for a classification. The function of a specific tool or adze form is still debated (Green and Davidson 1969). On fragments where either the distal or proximal end was missing, or both, a maximum width was taken. For those with recognizable ends, one of those ends was always the maximum width.

Cultural Period one was represented by three complete adzes and one incomplete adze of differing sizes. Only one adze was recovered in Cultural Period II. Most of the collection (n=15) was found on the surface in Cultural Period III.

The complete adzes (Table 4.2) found on site were all polished to an extent. The one found on the surface (artifact #667-1) is a type I adze (Figure 4.1). Its distal end is ground to a two-level bit. The front, or top, of the adze is 50% polished with a notch taken off for the hafting area. The back of the adze is flaked except for the bit. There is a chunk taken off one distal shoulder, this probably led to the discard of this tool. This is an example of the classic Samoan adze. The basalt has a bluish hue that is typical of the color of the fine-grained basalt on Tutuila. A surface survey of the head of the valley provided no evidence for this type of basalt in the valley. The basalt found here is coarser-grained and blacker in color. Artifact #141-1, a scraper made from a small cobble with a dark black color and cortex on both faces, might have been made from this material (Figure 4.2).

Two complete adzes were found in Cultural Period I of Block L: Artifacts #1029-1 (Figure 4.3) and #939-1 (Figure 4.4). Also found in this cultural layer of Block L were two adze fragments. Artifact #1118-1 (Figure 4.5) has had its bit roughly reworked. The other, artifact #978-1 (Figure 4.6), is the distal end of the adze. Artifact #1029-1 is classified as a type III adze. It is relatively thin, indicating use for finer wood working. It is almost completely polished on both sides. The color of the basalt is a white-gray

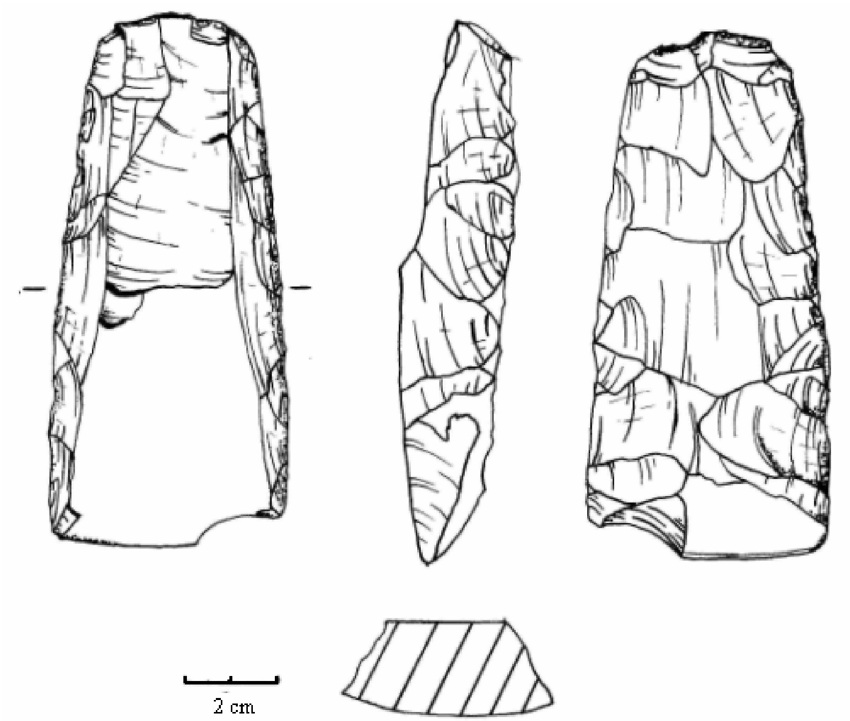

Figure 4.1: Artifact #667-1. Type 1 adze.

Figure 4.2. Type Ib scrapers recovered from Aganoa Village. Artifact #141-1, upper right corner, is a heavier black material than usually encountered in tools at Aganoa Village.

as opposed to the bluish-gray normal encountered. This could be due to the bleaching effects of being buried in sand for nearly 2000 years, but this is an unproven hypothesis. Artifact #332-1 is a type IV adze with polishing along the distal end to the midpoint on both faces. It is thicker than artifact #1029-1. This could imply use in heavy chopping like artifact #667-1.

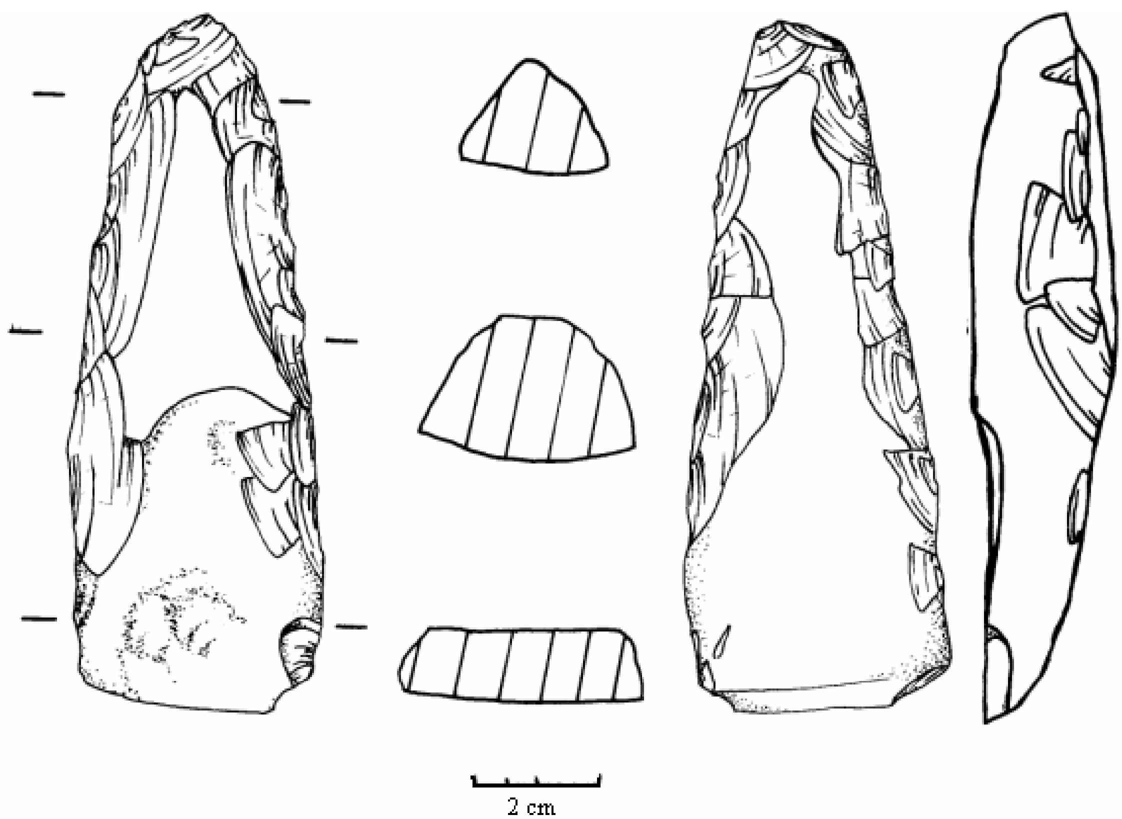

Figure 4.3. Artifact #939-1. Adze of unknown type.

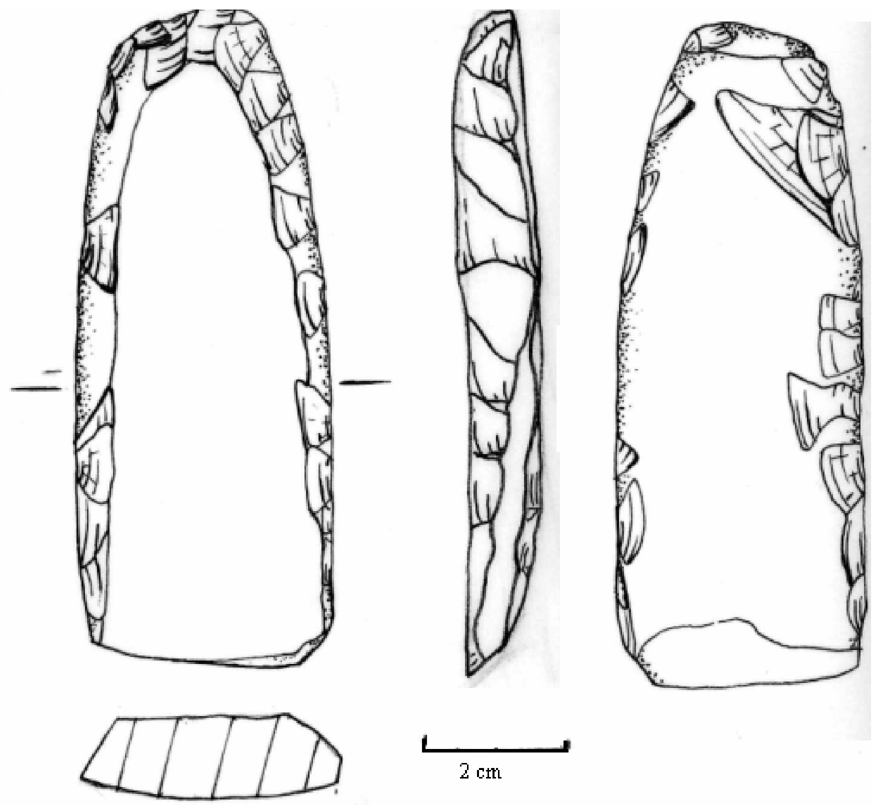

Figure 4.4. Artifact #1029-1. A type III adze.

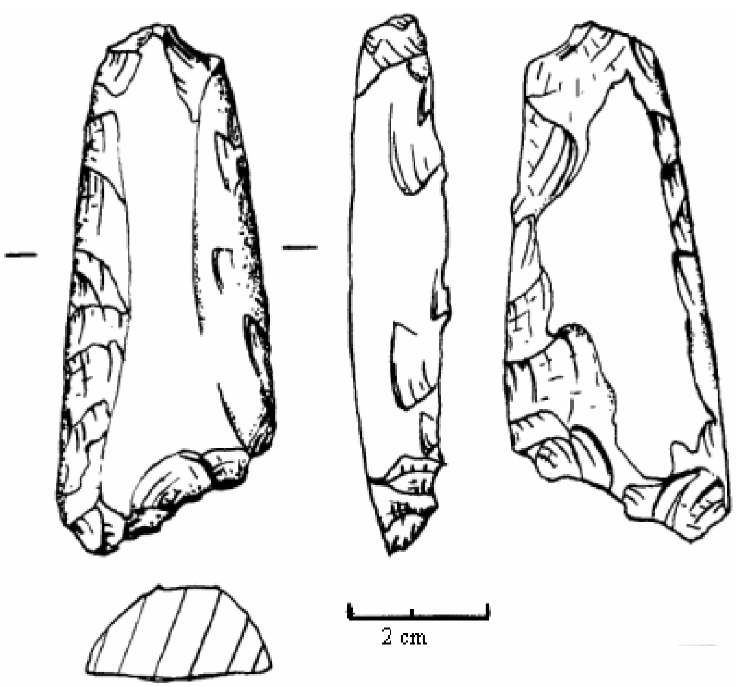

Figure 4.5: Artifact # 1118-1. A reworked adze from Cultural Period I, Block L.

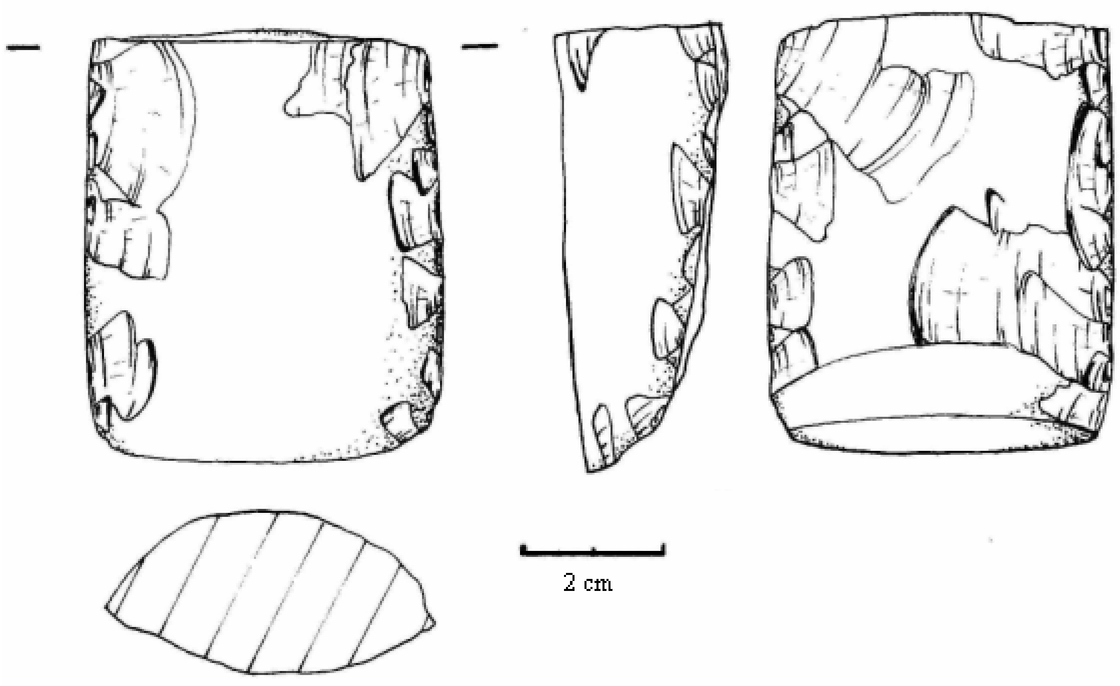

Figure 4.6. Artifact #978-1. An adze fragment, the distal end.

Table 4.2. Complete Adzes from Aganoa Village.

Artifact #	Class	Length	Width Distal	Width Proximal	Maximum Width	Weight	Color	Polish %
939-1	?	107.75	39.26	16.19	39.26	115.62	5y 5/1	<25
1029-1	III	90.52	33.19	22.23	33.19	59.5	5y 5/1	>75
332-1	IV	81.46	38.94	22.33	38.94	68.84	5y 5/1	>50
667-1	I	113.34	50.43	27.2	50.43	190.14	5y 4/1	<50

Artifact #939-1 is the most intriguing complete adze that was recovered. This adze is longer than the other three recovered from Cultural Period I sediments. It has the smallest percentage of polish than any of the other three adzes. The most interesting thing about it is its morphological attributes. The other adzes found have continuous cross-section shapes, either trapezoidal (artifact #667-1) or rectangular (artifacts #1029-1 and #332-1), while this adze has two different cross section shapes. From the distal end to the midpoint the adze has an oval cross-section, while from the proximal end to the midpoint the adze is triangular in cross-section. There is no type for Samoan adzes that covers this kind of dual shape. While #939-1 is longer than #1029-1 and #332-1, the width of the early adzes is relatively similar. There is no indication as yet why these tools were left behind without obvious flaws.

The adze fragments noted above provide little morphologically comparative information. It is interesting to note, however, that of the 13 noted, 4 have had their distal ends reworked to a usable edge (Table 4.3).

Table 4.3. Adze Fragments. Artifact Number and Classification. Type numbers in parentheses indicate possible categories but lack data to be sure.

Artifact #	Type/ Condition
1118-1	Reworked I/ Distal end missing
978-1	Fragment V/ Proximal end missing
749-2	Reworked I/ Distal end missing
15-1	Reworked VIII/ Distal end missing
23-5	Fragment VII/ Distal end missing
1154-2	Reworked Adze/Distal end missing
332-2	Adze Fragment/ Distal end missing
870-1	Medial Adze Fragment (VI, VIII)
13-1	Medial Adze Fragment (VI, VIII)
197-4	Medial Adze Fragment (V)
53-1	Medial Adze Fragment (II)
197-3	Medial Adze Fragment (IV, V)
163-4	Medial Adze Fragment

The adze fragments were probably broken during use and reworked to continue or finish a job. Artifact #1118-1 is a good example of this. Its front is finely polished producing the smoothest surface of all of the polished adzes that were recovered. Where a polished bit should be, there are jagged flake scars producing a roughly serrated edge. This artifact was probably broken during its original use, and then its broken end was roughly reworked. This quick type of reworking shows that adzes were probably not easy to come by. The polished bit would supply a flat or convex end with the bit angling away on the bottom. This reworking has produced a point with the apex occurring at the midpoint of the thickness of the adze. This angle would be harder to use in the cutting, edging, or carving of wood as it changes the cutting angle of the adze.

Although the function of each adze type is uncertain it is clear that this is the most important tool type in Samoa. Adzes have been produced in Samoa for at least 2000 years. Unlike other parts of the world where projectile points were consistently fashioned for many thousands of years, Samoa does not have evidence of such projectile tools. The most care and consideration was placed in making adzes as evidenced by the amount of polish, meanwhile the flake tools usually do not incorporate a grinding method during production.

Scraper and Flake Tool Analysis

The flake tools, or scrapers, were analyzed for length, distal width, proximal width, weight, Munsell color, presence or absence of cortex, and the number of dorsal scars. The maximum width for each tool was at either the proximal or distal end. The presence of cortex was noted in terms of the face on which it was located. Dorsal scars were counted and recorded (Appendix B).

Flake tools were the most frequent tool type recovered at Aganoa Village. These tools may have been used to extract the meat of coconuts (Hiroa 1930) although other uses could also have been possible. A total of 40 flake tools were identified, representing nearly two-thirds of the total tool assemblage. Such a discrepancy between flake tools and adzes is found to be typical of village sites on Tutuila but not other islands of the Samoan archipelago (Clark and Herdrich 1993). This could be due to the fact that other islands in the archipelago are not characterized by easy access to such fine-grained volcanic rocks as on Tutuila so that humans instead had to rely on modified shells as scrapers.

Figure 4.7. Type Ia scrapers from Aganoa Village.

The flake tools were dominated by type I forms, the classic coconut graters of Clark and Herdrich (1993) (Figure 4.7). Type I flake tools are conventionally split into two sub-categories based on the angle of the sides from distal to proximal ends. Type Ia has sides that travel at an angle getting nearer from distal to proximal ends, while type Ib has parallel sides from one end to the other. Both categories *a* (n=8) and *b* (n=10) had at least double the numbers of any other category. Class Ia forms would be an even more frequently occuring category except for a discrepancy in form of four artifacts.

Four tools appear to fit in nicely within class Ia, but they also had attributes of class V flake tools (blades). Type V forms are typified by one curved lateral margin worked into a cutting, scraping or slicing edge while the other side is either a blunt cortical edge or flaked to be flat. The four tools in question have distal ends that are flat and steeply worked like those of class Ia tools, but each artifact has one lateral margin that looked like those of class V tools (Figure 4.8). Instead of continually questioning where these specimens belong, they were placed into a different category, class Ia/V, to keep them separated from typical class Ia artifacts. The difference in form might be an indication of a difference in function or a difference in the shape of the blank used to produce them. Only further research will be able to answer this question. Further investigation might make a case for these being a new type of tool to be added to the current typology, but the occurrence of four of these tools at one site does not yet require the creation of a new type.

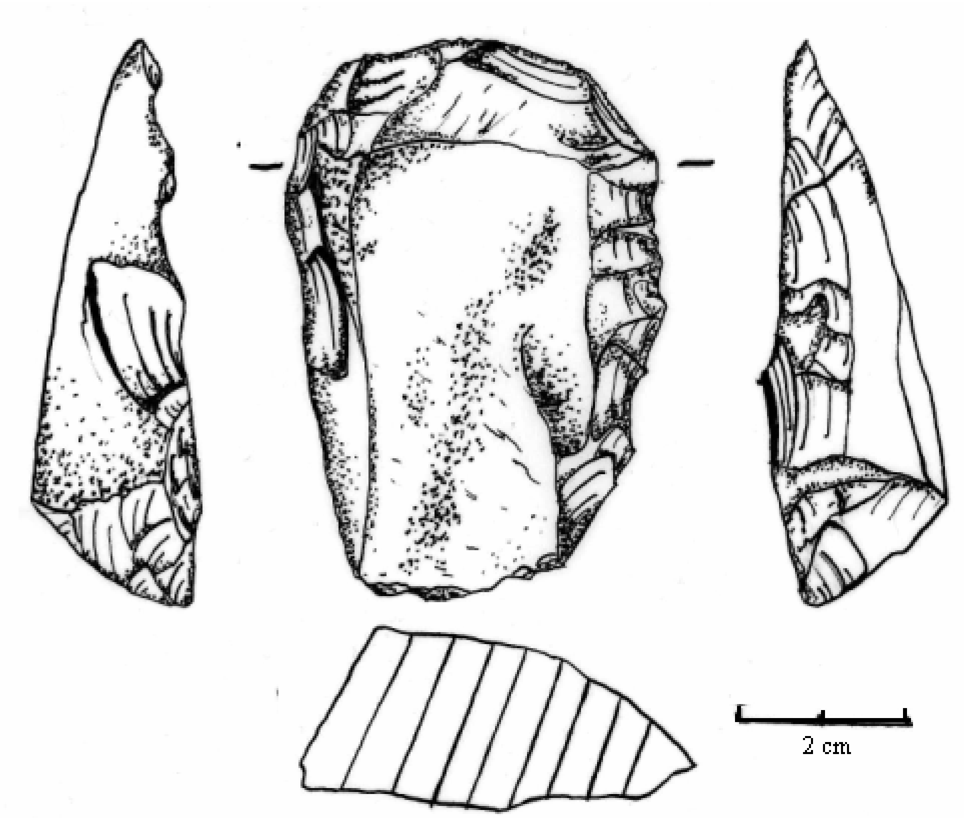

Figure 4.8. Artifact #150-1 from Aganoa Village. An example of a combination scraper Ia/V. Notice that one edge is worked (rt) while the other is unworked and flat (lt).

This type of tool combination might be a clue into the fact that Aganoa was not a workshop. If tools were being steadily made at the site, why would combination tools need to be created? The wealth of raw material that should be found at a workshop site should supply enough stone to make individual tools for individual jobs. This combination class does not fit in these stipulations. It could be an indication of the conservation or recycling of the material in order to best utilize the resources.

Artifact #1160-1 was classified as a chisel, a class unto itself. This large flake tool is unifacial. The distal end is steeply worked like a scraper. One side has had a large flake removed following the full length of the tool. This tool could have been used for carving boats or other wood crafts. It is the size of the artifact that keeps it apart from the other flake tools. This tool is over 16 mm longer than the next-longest flake tool. Based on its size this tool may be considered an adze, but its unifacial nature and steep cutting edge place this tool amongst the flake tools found.

There were six lithic artifacts that stood apart during analysis. These tools represent tool types of either unknown function or classification, but clearly were used in prehistoric times. Artifact #532-1 is a rounded ball of vesicular basalt (Figure 4.9). This is almost spherical in shape and bears no evidence of polish or wear that would indicate hafting. This odd artifact could have been used in a variety of ways. The most intriguing is the possibility of it being a weight for fishing, probably for a net. Another artifact of unusual interest, #23-2, is a cobble-sized stone that is in the shape of an adze (Figures 4.10 a and b); however it is made of lighter colored basalt and has rounded edges. There is evident usewear in the forms of nearly parallel striations along one lateral margin visible macroscopically on the wide end. What this object was used for is unknown. It possibly was a polishing stone or hammerstone.

Figure 4.9. Artifact #532-1. A possible fishing weight.

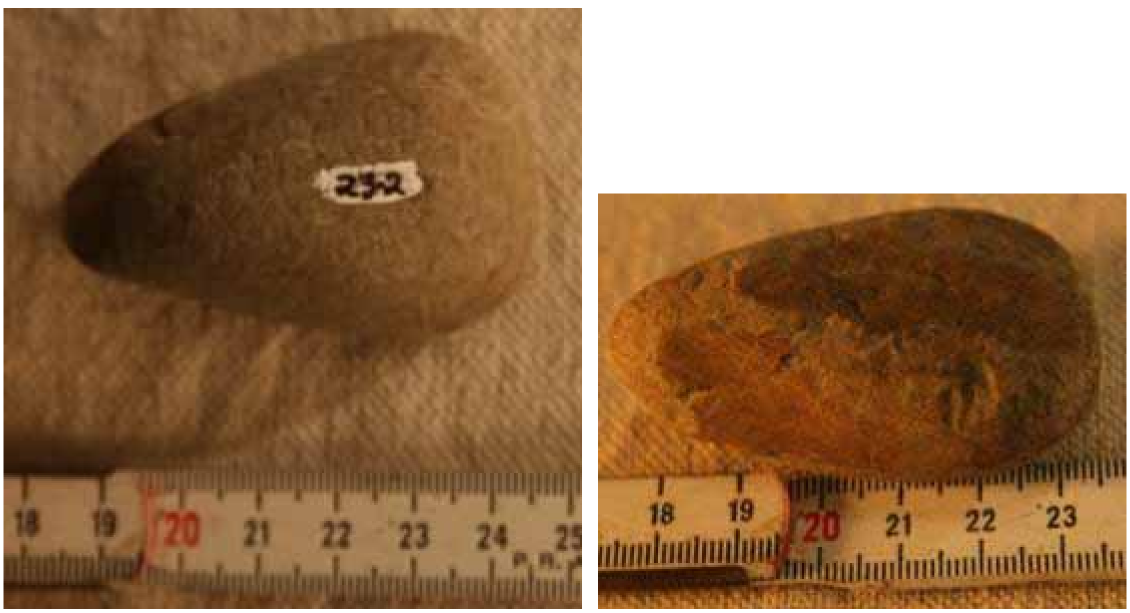

Figure 4.10. Artifact #23-2. Rounded adze-like lithic artifact. Right, detail of possible usewear. Picture a on right, b on left.

It is interesting to note that no scrapers were recovered from sediments of Cultural Period I. Ten scrapers, however, were found in sediments of Cultural Period II. This could indicate a heavier reliance on agricultural goods and less on marine subsistence strategies. Twenty-nine more scrapers and other flake tools were found scattered on the surface throughout the excavation site.

Debitage Analysis

Aspects of the debitage were recorded by measuring weight, maximum length (perpendicular to the platform), maximum width (parallel with the platform), maximum thickness, and the number of dorsal scars (Appendix C). For those attributes not metrically measurable, the Munsell color chart, overall condition of the flake, type of break, termination, and platform preparation were recorded. Besides the measurements, debitage class was recorded in terms of primary cortical (n=5), secondary cortical (n=27), and tertiary flake (n=512).

To analyze the debitage, I first separated them into three classes; Flake (mostly complete) (n=401); Rejuvenation flake (flake with a polished surface that has been removed from a tool) (n=47); and angular shatter (debitage piece that shows no regular attributes of a flake) (n=129). There were some pieces that did not fit easily into these categories. Those were set aside as possible core, cortical spall, thinning flake, and utilized flake.

Those placed in angular shatter did show cortex covering most or all of the dorsal face. These are currently not believed to be flakes from the manufacturing or reworking of tools. These flakes represent a small collection of the fire-cracked rock (FCR) present at Aganoa. FCR was not collected during the excavation, due to its incredible volume on the site.

Results

If, indeed, the manufacture of adzes was taking place at Aganoa, then it was not with raw cobbles or boulders. The Samoans working stone at Aganoa might have been working on large blanks or rough performs to create adzes. The preform of an adze is long and rectangular and usually lacks the cortex of the parent material (Leach and Witter 1985). To get it to the appropriate size to polish or use, one would have had to strike the preform along the sides, producing flakes that were wider than they are long. The flake would have traveled across the lateral margin of the preform and taken off the whole edge of the opposite side. There is a high occurrence of flakes from Aganoa being wider then they are long.

Add to the argument against Aganoa Village being a workshop, the existence of a number of rejuvenation flakes (n=17). These flakes were labeled rejuvenation flakes due to the presence of polishing on either the dorsal face or the platform, or both. This is not to say that other flakes were not made in rejuvenation efforts. It is simply not possible at this time to determine if a flake without the presence of polish or a previously worked edge were created during the process of manufacture of rejuvenation. These flakes are evidence that adzes were being modified to continue their intended use or to create new tools. This would not be a practice that one would expect to see at a lithic workshop.

The debitage found at the site is small in quantity compared to sites that are near workshop areas or quarries (Clark 1992). Numbering only 1,445 pieces, the debitage includes a high number of tertiary flakes, with few flakes having any signs of the parent cortex. Most of the flakes are small and thin, indicating precise work. Flakes that occur during the early stages of adze production are usually large and thick, created as the manufacturer removes large chunks to more rapidly prepare a blank into a preform. As stated earlier, a high number of the flakes are wider than they are long. This is an indication of working performs or reworking already fashioned tools. Debitage with polish represents a small percentage, only 2% of the assemblage (n=27).

Not all of the debitage is a result of adze modification. The manufacture of scrapers produces small debitage when shaping the steep cutting edge. A more thorough analysis of the debitage might provide insights into lithic working at a residential site on Tutuila.

Cultural Period III represents more than half of the entire debitage assemblage from Aganoa Village (n=862, 60%). Debitage from Cultural Period II is the lightest count of the three periods, indicating a possible lack of creating or re-working stone tools during this time. Cultural Period I represents just under a quarter of the total debitage (n=321, 22%). Polished debitage recovered from this level only numbers five.

CHAPTER V

CHEMICAL CHARACTERIZATION METHODS

To further understand lithic production as Aganoa Village, INAA results of a sample of the Aganoa Village lithic assemblage were compared to the baseline already set down by Johnson (2007). By doing so it was hoped that the source quarries for lithics recovered during the excavation could be identified. In addition, this project sampled four quarries: Tataga-Matau to the west, Lau'agae to the east, Asiapa and Alega closer to the west (Figure 5.1). INAA is ideal for this type of test because it allows a very detailed view of the chemical characteristics of the samples tested. Due to the fact that the Tutuilan source flows are very chemically similar, this detailed view is necessary.

Figure 5.1. Tutuila Island. Locations of Aganoa and the four quarries sampled by Johnson et al. (2007).

When I began the research for the source material of the lithic assemblage of Aganoa, I based it on a model consisting of concentric circles of specialization from Aganoa. It was originally expected that the first cultural period represented at Aganoa (c. 2500 BP) would have tools from a nearby source, possibly Lau'agae or Asiapa. The sphere of influence would then get larger through cultural periods II and III eventually including the use of materials from Tataga-Matau during the last 1,000 years. This was based on the idea that as time went on the lithic materials from farther and farther away became more available. The data has shown otherwise.

The sampling strategy implemented included the choosing of 90 samples. Parameters were set based on cultural period and color of the lithics. Thirty samples were chosen from each of the three cultural periods to obtain an even overview of possible change through time. The other parameter was based on the fact that most of the assemblage could be described as blue-black or gray-black in color. These colors might be an indication of production source. The sampling strategy attempted to get an equal number of each color; 45 blue-black and 45 gray-black. Due to the fact that the frequency of colors appear to change temporally from predominantly gray to predominantly blue from Cultural Periods I to III, the balance of the color samples were spread throughout the sample and not specific to cultural period. Samples chosen needed to be at least 1cm thick for a substantial portion of the artifact. This was necessary to remove the cortex during preparation so that the sample would be entirely from the interior of the artifact. This process avoided contamination from soils that might still be attached to the exposed area of the artifacts. A final sampling strategy included the biased choosing of samples that had once been a part of a tool. Debitage that had been removed from a completed adze as evidenced by the presence of polishing on at least one side of a flake were particularly sought out. The samples chosen include these reworked flakes, regular debitage, and, in a few cases, portions of adze fragments that were removed with a rock saw.

The samples were photographed from at least four angles for documentation before they were processed for INAA. Each sample was prepared individually. A fresh pair of gloves was used in handling each sample to avoid cross-contamination. Each sample was place in a sterile zip-bag and wrapped tightly. This was then placed in another sterile Nasco Whirl Pack© bag and again wrapped in order to supply more coverage and avoid contamination from the first bag puncturing. The sample was then placed between two polished, stainless steel plates (4”x 4”x $^{1}/_{4}$”) that were then placed in a pneumatic press. The amount of pressure applied differed by sample. Thicker samples required more pressure to ensure sufficiently small pieces, while thinner samples received less so that breakage would result in a powder too small to collect. The amount of pressure needed per sample was based on the sound of the rock as it splintered. It quickly became a practiced technique as the entire process unfolded.

After shattering the sample the outer bag was removed and the inner bag was opened so that a sample could be collected with sterile, surgical tweezers. The pieces chosen had no exterior portions of the original artifact so that an accurate reading could be obtained that did not include the matrix in which the artifact was embedded. Each sample was placed in a small plastic tube that remained closed until the final weighing for the INAA counting. The steel plates and tweezers were washed thoroughly with de-ionized water before working with each new sample.

Once all 90 samples had been prepared, each sample was individually weighed out to 50 mg. These were placed in smaller plastic containers approved for use in the INAA radiation process. Each seventh sample was taken twice to supply redundancy for assurance that the INAA process went without fault. Standards were measured along with the samples from Aganoa. SRM-688 basalt grains were used as the standard to assure correct measurement.

All of this work was accomplished under the direction of Dr. Willliam James, director of the Elemental Analysis Laboratory (EAL), Texas A&M University. The samples, after preparation, were sent to the Nuclear Science Center of Texas A&M University to be run through their reactor. Germanium detectors were used to measure short-lived elements. The samples were then returned to the EAL for the counting of longer-lasting elements.

The results of the INAA process were placed in an SPSS 15 (for Windows) spreadsheet. To make my data comparable to Johnson et al.'s (2007), the natural log of each result was calculated. This was a necessary step to normalize the data and make them more accessible to statistical tests. At this point Johnson et al. (2007) ran a Canonical Discriminant Analysis (CDA) to determine whether each quarry was identifiable as a statistical group (Figure 5.2). This type of application relies on the previous knowledge of group membership to test the accuracy of each sample and how well they match each group. The same data were then run through a Principal Components Analysis (PCA) to show the grouping with the first two factor scores (Figure 5.3). Unlike CDA, a PCA does not rely on the previous knowledge of group membership. The plotting of factor scores from a PCA will show possible grouping of the material. When the groups are unknown from the beginning, a PCA will provide a biplot that should show separation between groups. A K-Means Cluster Analysis was applied to the data from Aganoa Village to assure proper cluster membership. With the removal of one sample the clustering worked out nicely. The Aganoa data were then combined with the Quarry data and a PCA and CDA were executed. From the CDA results, conclusions could be reached for the origin of stone artifacts at Aganoa Village.

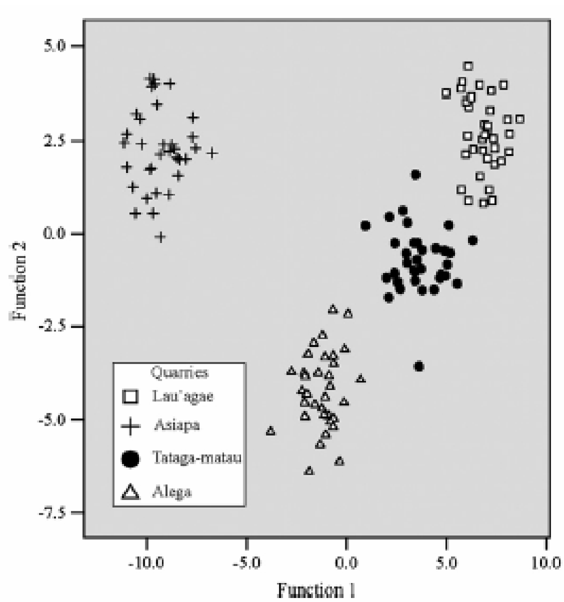

Figure 5.2. Johnson's biplot of CDA functions 1 and 2 (Johnson et al. 2007).

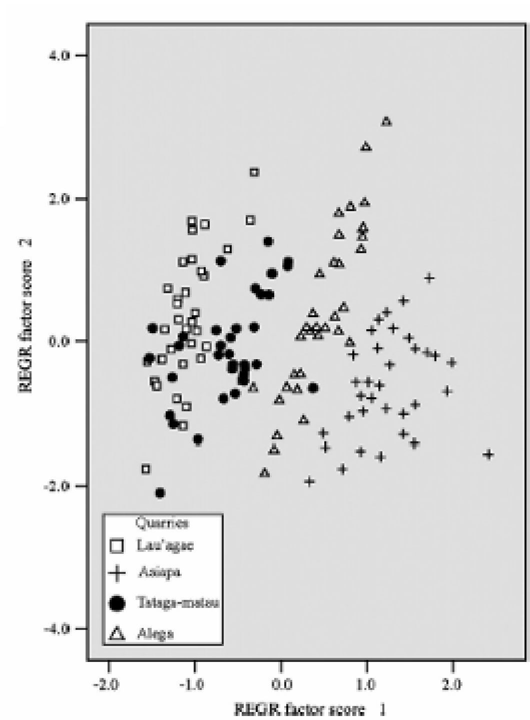

Figure 5.3. Johnson's biplot of PCA scores 1 and 2 (Johnson et al. 2007).

Results

As stated previously, a CDA requires previous knowledge of group membership. The Aganoa data at this point had no group distinction. Therefore a CDA test could not be done initially. Instead, a PCA was the first test run on just the data from Aganoa. All of the elements were well-represented in the sample except for Uranium. Only 58 of the 103 samples had a measured value for Uranium. A PCA run on the log values including Uranium show that the first two Eigenvalues explain 71.914% of the data while a third Eigenvalue adds another 5.75% (Table 5.1). These Eigenvalues show how much of the data each component of the PCA explains. Often values greater than 70% are accepted (Baxter 1994). By observing the Eigenvalues, one can be sure to use factor scores from a PCA that describe an appropriate amount of the data (Baxter 1994), which are usually found in the first few values.

Table 5.1. First Seven Eigenvalues of Aganoa Assemblage Including the Uranium Values.

Component	Total	% of Variance	Cumulative %
1	17.085	61.018	61.018
2	3.051	10.896	71.914
3	1.610	5.750	77.664
4	1.523	5.440	83.104
5	1.070	3.821	86.926
6	.644	2.301	89.226
7	.532	1.902	91.128

The Uranium variable was removed and the results improved. The first two Eigenvalues now explained 78.957% of the data with the third Eigenvalue adding an additional 4.616% (Table 5.2). Based on this evidence we chose to remove Uranium from consideration in all further statistical analyses.

Table 5.2. First Seven Eigenvalues of Aganoa Assemblage Excluding Uranium.

Component	Total	% of Variance	Cumulative %
1	18.629	68.998	68.998
2	2.689	9.959	78.957
3	1.246	4.616	83.572
4	1.037	3.842	87.414
5	.575	2.130	89.544
6	.492	1.823	91.367
7	.451	1.670	93.037

One more problem with missing values persisted. Some of the samples were missing values for various elements. The more rigorous path would lead to the exclusion of these samples. A less rigorous method would be to replace the missing values with the means of the cases. Using the data with missing values replaced by means uses all 103 samples. A PCA without the missing values being replaced uses 80 samples. A scatterplot was made of the first two factor scores from PCA for both methods (Figures 5.4 and 5.5). The clustering of the samples is more clearly seen in Figure 5.5 for the values without replacement. The other scatterplot also shows good grouping but analysis is less specific. In interest of retaining the most rigorous methods possible, it was chosen to use the data that excludes cases with missing values. Due to the true mixing of cultural periods within each group this choice should not make much difference in our results and conclusions.

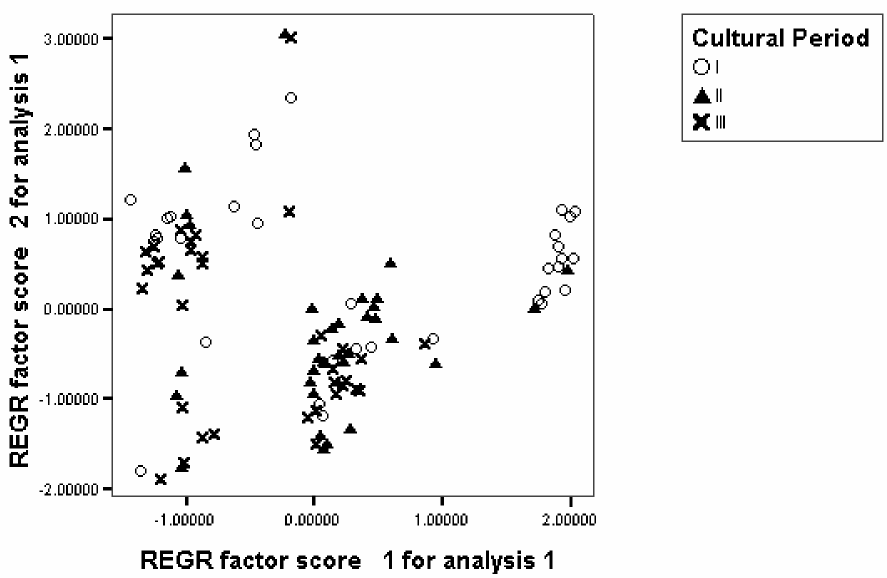

Figure 5.4. Scatterplot of factor scores 1 and 2. Missing values replaced by mean values.

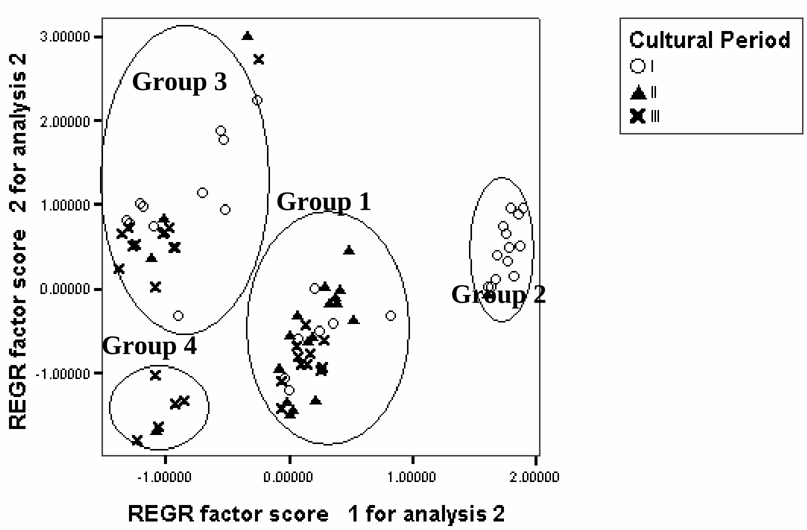

Figure 5.5. Scatterplot of PCA factors 1 and 2. Missing values excluded.

The data separate into three, possibly four, groups with outliers existing to the top of the graph (Figure 5.5). The K-Means Cluster analysis was performed using the assumption of four groups to support the findings. A scatter plot of the PCA factor scores 1 and 2 is presented in Figure 5.6. The outlier was given its own group (2). Another group (1) was scattered in among the other data and not easily picked out.

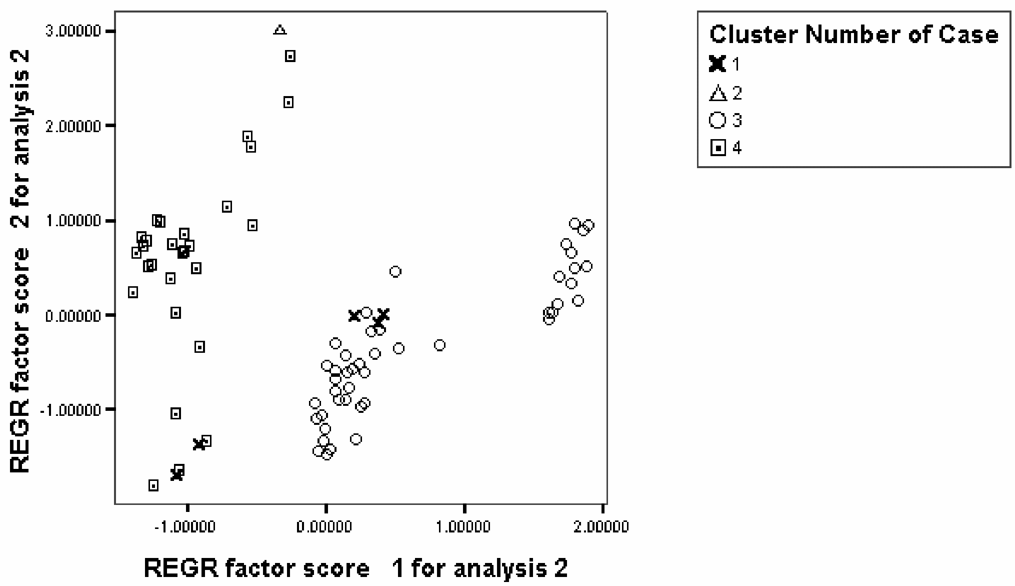

Figure 5.6. Scatterplot of factor scores 1 and 2 with cluster membership identified.

A cluster analysis assuming three groups provides no clearer data again separating the outlier (sample number 51) to its individual group. If this sample is removed then the results improve and match the PCA scatterplot. The identification of these four groups shows that the Aganoa assemblage represents three or four different quarry sources (Figure 5.7).

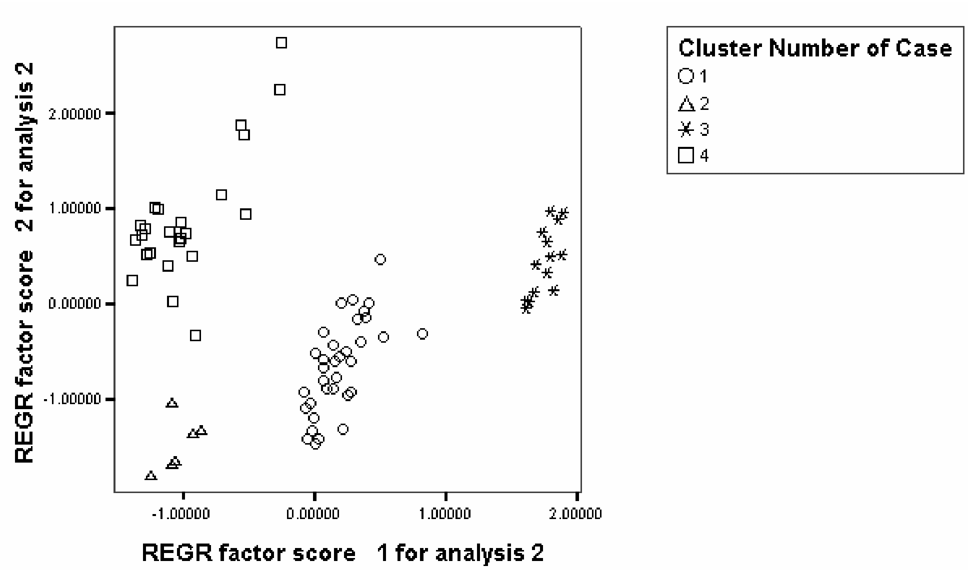

Figure 5.7. Scatterplot of factor scores 1&2. Cluster membership is identified. Sample 51 removed as an outlier.

The next step in the statistical analysis was to reproduce the PCA scatterplot of Johnson et al.'s (2007) quarry data. Similar steps were taken to those above. A PCA analysis was run on the natural log of the quarry data and the first two Eigenvalue factor scores were placed against each other (Figure 2.24). When Figures 5.2 and 5.8 are compared they are nearly identical. Therefore, having reproduced the original results the quarry data and the Aganoa data were combined.

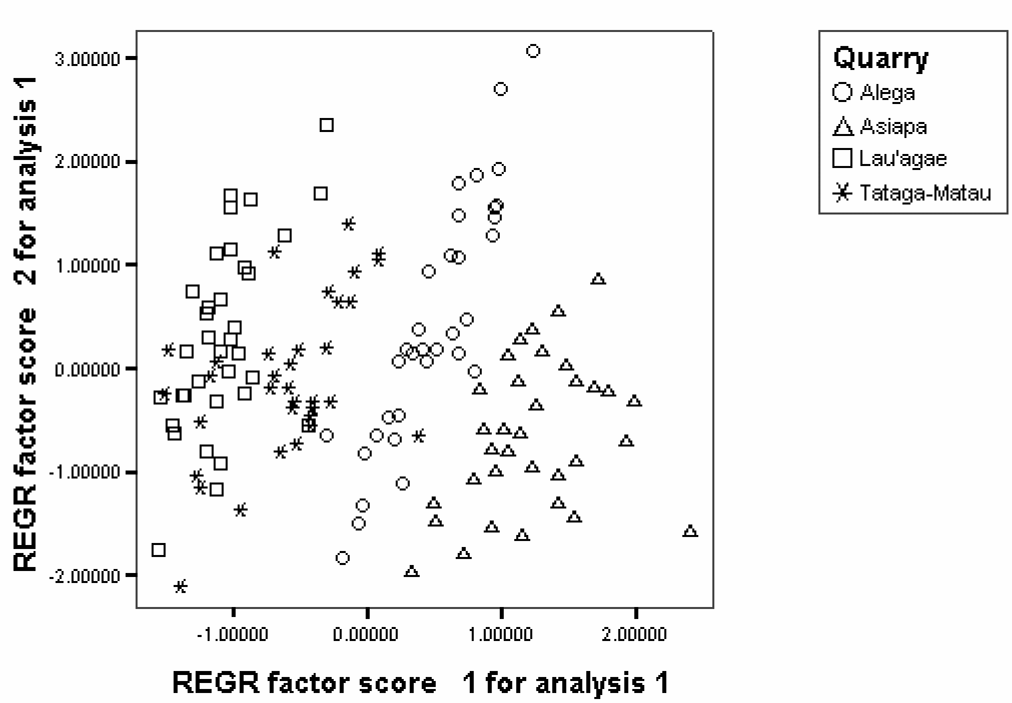

Figure 5.8. Scatterplot of Johnson et al.'s (2007) Quarry data. Factors 1 and 2.

The combined data were again put through a PCA. The outlier from the Aganoa data was included in the steps from this point out. It was only removed to gain a clearer view of the cluster information. The total PCA showed that the first two factors explain 71.864% of the data (Table 5.3). The addition of the third component explains 77.614% of the data.

A scatterplot was then made of the first two factor scores for the combined data (Figure 5.9). Aganoa groups 3 and 4 do not match with the quarry data. Group 1 appears to fall in line with the Asiapa Quarry. Group 2 lies in the midst of the grouping of Tataga-Matau and Lau'agae. This group is the only definite representative sample that is present in the quarry database. Group 1 is close enough to be considered part of the Asiapa quarry. This leaves the data in groups 3 and 4. These data probably represent at least one, possibly two, quarries that were not originally sampled by Johnson et al (2007).

Table 5.3. First Seven Eigenvalues of PCA of Combined Quarry and Aganoa Data.

Component	Total	% of Variance	Cumulative %
1	16.927	62.692	62.692
2	2.476	9.172	71.864
3	1.553	5.750	77.614
4	1.114	4.126	81.740
5	.866	3.208	84.948
6	.746	2.764	87.712
7	.652	2.413	90.125

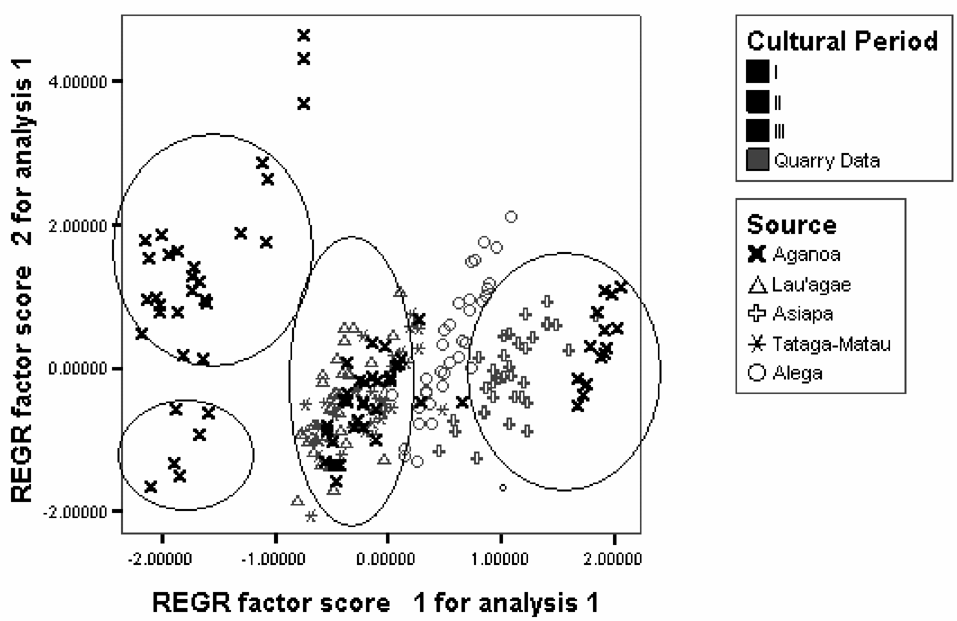

Figure 5.9. Scatterplot of PCA factors 1 and 2 of combined Aganoa and Quarry data.

An attempt was made to get a closer look at group 2 of the Aganoa data and the two quarries Tataga-Matau and Lau’agae. The need to see the difference between these two quarries is important as they lie on opposite sides of the island. They therefore hold heavy implications for the procurement strategies of the villagers of Aganoa.

Group 2 of the Aganoa data, the Tataga-Matau data, and the Lau’agae data were separated into a new spreadsheet. The statistical process followed thus far was repeated for this shortened data set. The PCA showed that the first few Eigenvalues do not explain as much in this tight cluster (Table 5.4). The scatterplot of the first two factor scores show no distinction of the Aganoa data between Tataga-Matau or Lau’agae (Figure 5.10).

The Aganoa data in this group were then separated out and a PCA and K-Means Cluster Analysis was run on this small sample to see if the data would group on their own in such a way that I could distinguish two or more groups that might follow the Quarry data and separate to represent Tataga-Matau and Lau’agae. Figure 5.11 shows the scatterplot of factor scores 1 and 2 with the cluster membership identified. As can be seen, the data do not separate out in a decipherable way to distinguish between Tataga-Matau or Lau’agae.

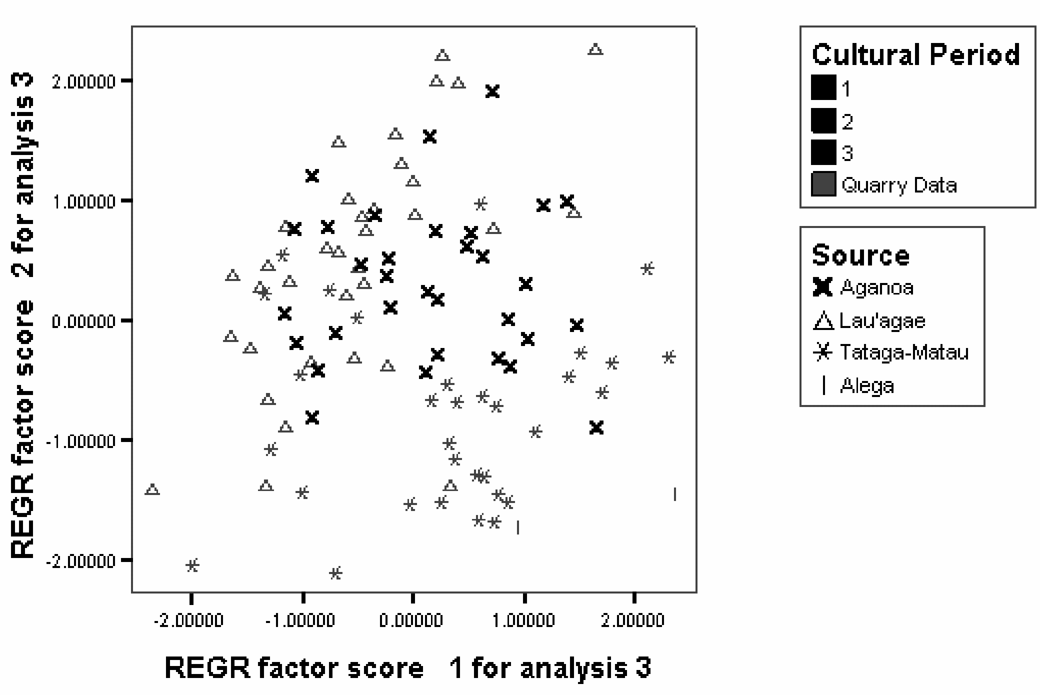

Figure 5.10. Scatterplot of the factor scores for Group 2, Tataga-Matau, and Lau'agae.

Table 5.4. First Seven Eigenvalues for the PCA of Group 1, Tataga-Matau, and Lau'agae.

Component	Total	% of Variance	Cumulative %
1	8.658	32.067	32.067
2	4.433	16.420	48.487
3	2.582	9.562	58.050
4	1.861	6.891	64.941
5	1.576	5.838	70.780
6	1.142	4.228	75.008
7	.875	3.240	78.247

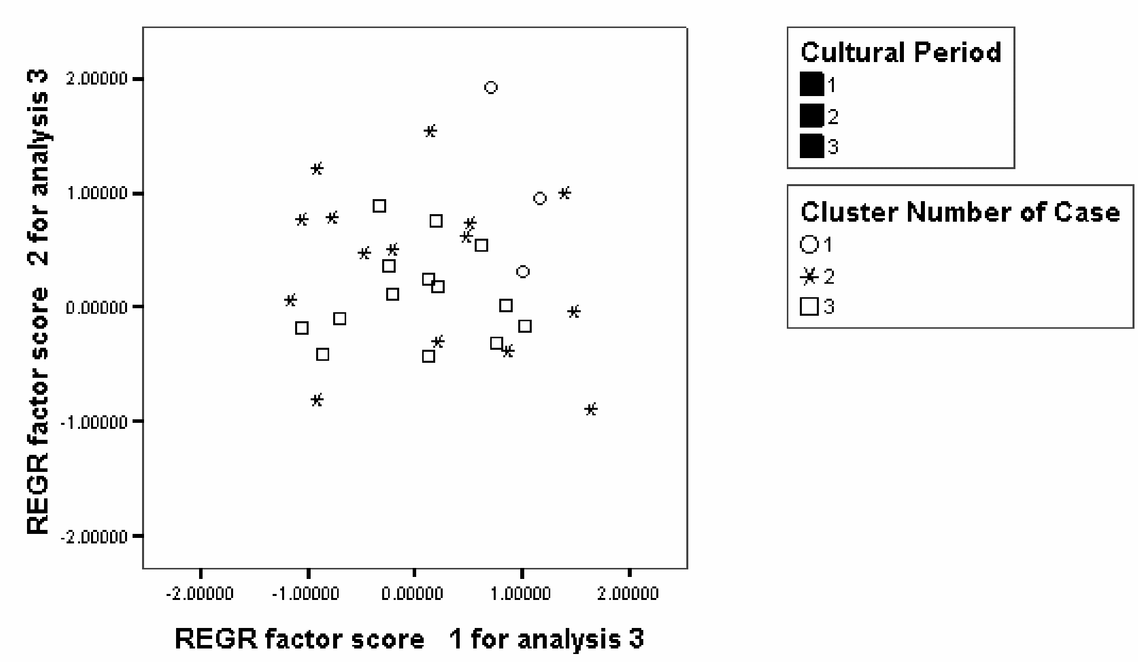

Figure 5.11. Scatterplot of the cluster membership for Group 2.

At this point it became necessary to run CDA tests on the data to see if more defined groups could be ascertained. Using only the Aganoa data without Uranium or outlier, two CDA's were run using Cultural Period and Cluster membership as grouping variables. Since CDA requires the previous knowledge of group membership, I applied the K-Means cluster results. The scatterplots of the discriminant scores showed different results. The one based on Cultural Period showed no definition (Figure 5.12).

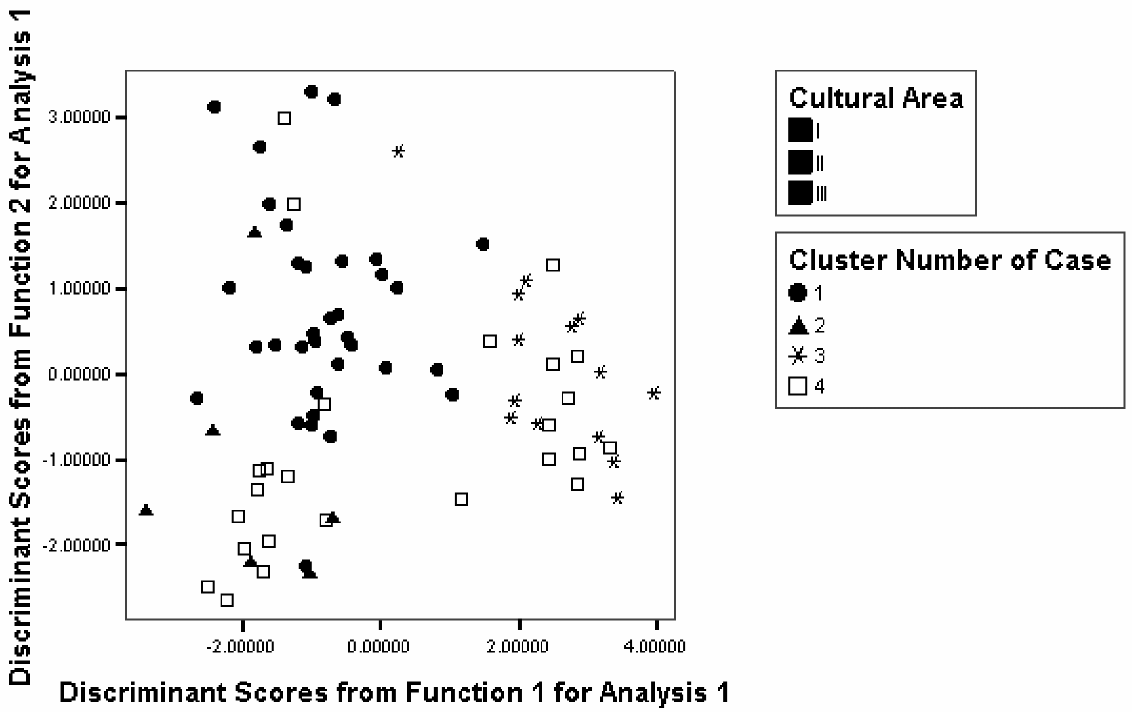

Figure 5.12. Scatterplot of the CDA discriminant scores grouped by cultural period.

The CDA using cluster membership as the grouping variable produced excellent results (Figure 5.13). The first two Eigenvalues in this analysis explains 98.2% of the data. The four clusters are clearly visible in the scatterplot. This evidence gives further credence of a four-source model for the basalts from the village of Aganoa.

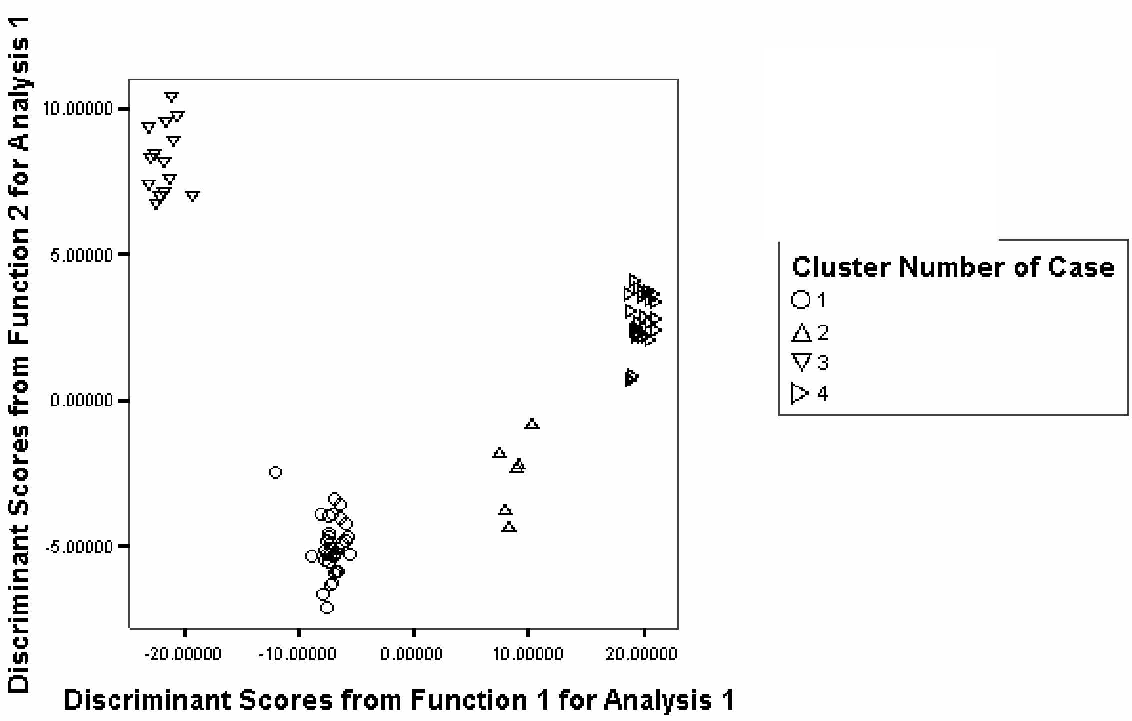

Figure 5.13. Scatterplot of the CDA discriminant scores 1 and 2 after grouping by K-Means cluster membership.

The PCA results for the combined Aganoa and Quarry data have already shown two groups from the Aganoa data do not match any of the four quarries analyzed by Johnson (2007). One group is a possible match with Asiapa. Finally another group separated out from the Aganoa data to be placed in the midst of Tataga-Matau and Lau’agae. The CDA analysis proved effective for just the Aganoa data so the Quarry data was added. Figure 5.14 shows the scatterplot for the first two discriminant factors. Group 3 from Aganoa is still closest to the Asiapa quarry, but this biplot shows a clear separation between the Aganoa group and Asiapa. This evidence implies that these artifacts came from a quarry near Asiapa with similar chemical composition. Group 1 from Aganoa again falls around the tightly grouped Tataga-Matau and Lau’agae

Quarries. With the original scale in place it appears that the Aganoa Group 1 fits better with Lau'agae than Tataga-Matau. The relationships can be seen more clearly with adjustments to the X and Y axes made in SPSS Chart Editor to exclude the other data (Figure 5.15).

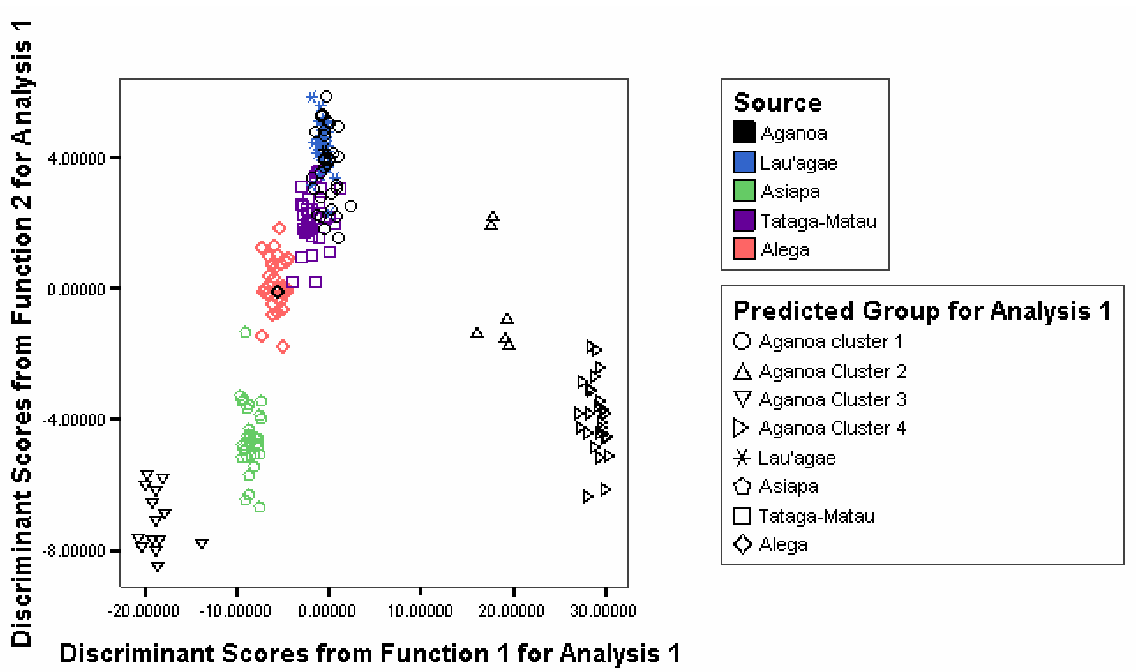

Figure 5.14. Scatterplot of discriminant scores 1 and 2 of combined Quarry and Aganoa data.

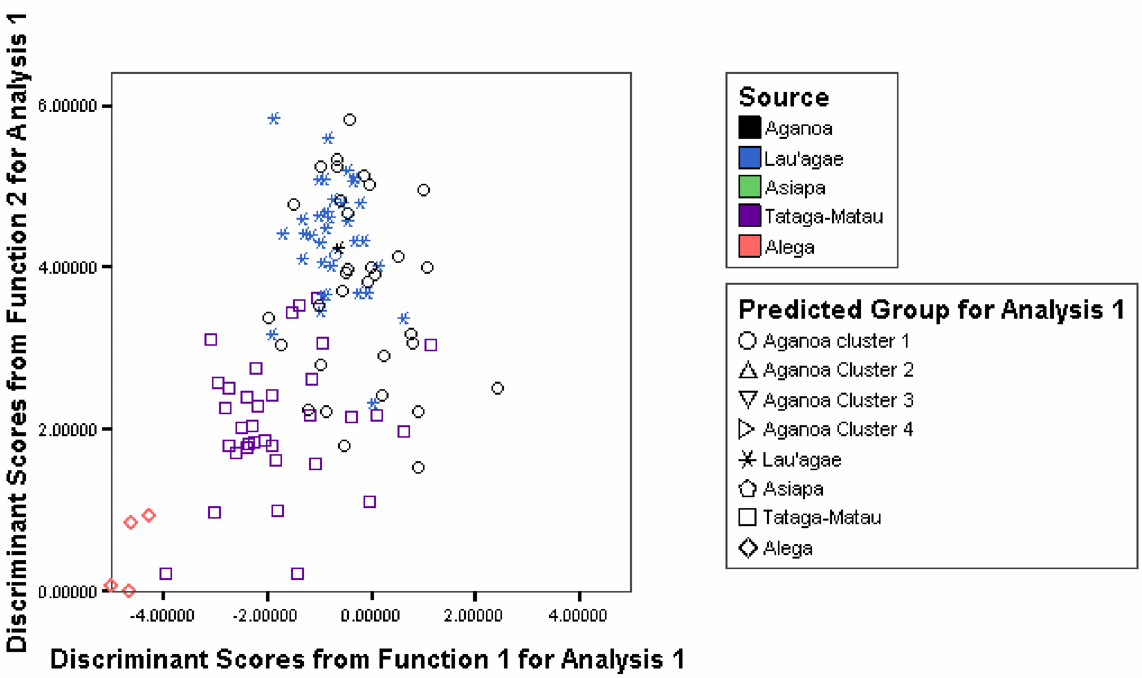

Figure 5.15. Scaled view of the scatterplot of discriminant scores 1 and 2 of combined Quarry and Aganoa data showing detail of grouping with Tataga-Matau, Lau’agae and Aganoa Group 1.

A new CDA was run including Group 1 as members of Lau’agae quarry (Figures 5.16 and 5.17). The first two scores represent 95.4% of the data. The results show that most of the group joined with Lau’agae with a probability of greater than 95%. In fact, 15 of the samples ranked below 100% but above 96.8%, and only three samples had values less than 95%: Samples 47 (59.5%), sample 76 (67.9%), and sample 101 (63.7%).

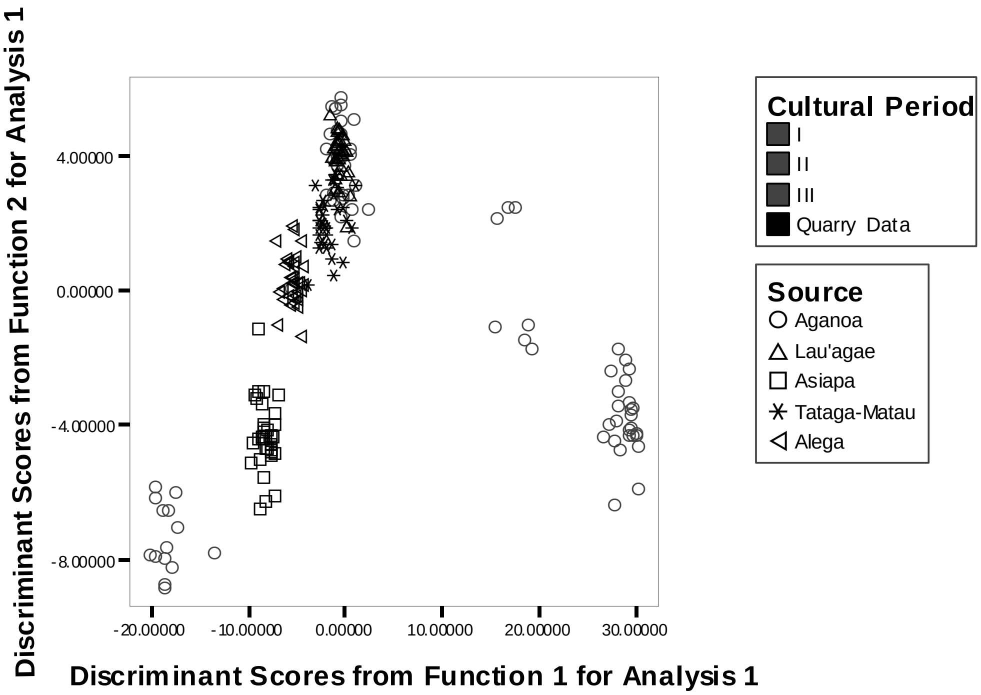

Figure 5.16. Scatterplot of discriminant scores 1 and 2 of combined Quarry and Aganoa data. Aganoa Group 1 defined as members of Lau'agae group.

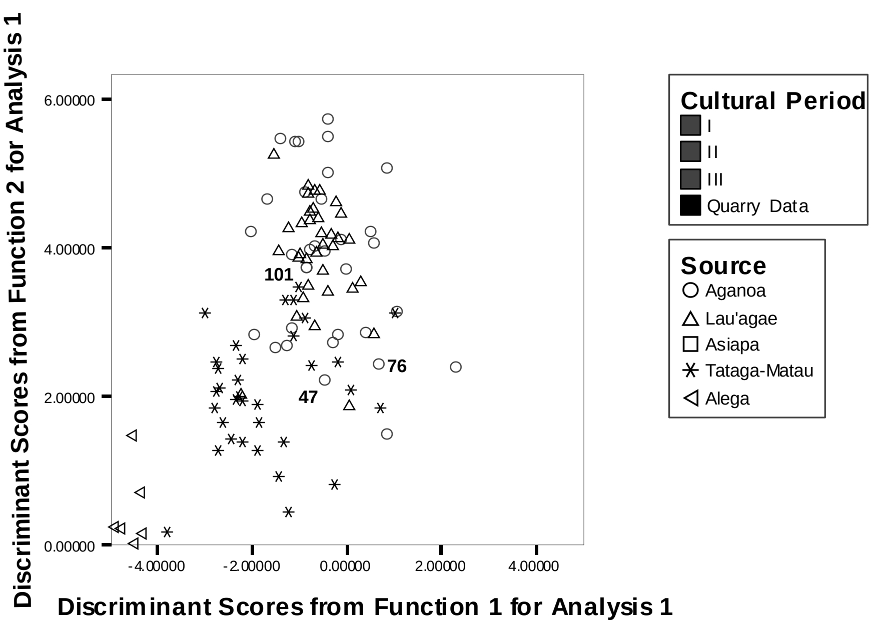

Figure 5.17. Scaled view of the scatterplot of discriminant scores 1&2 of combined Quarry and Aganoa data showing detail of Tataga-Matau, Lau'agae and Group 1 defined as Lau'agae cluster. Labeled are the three samples with less than 95% confidence.

With the new evidence of the three samples that do not combine with Lau'agae confidently, these samples were placed with Tataga-Matau and CDA was run again. Sample 47 resulted with a 99.9% confidence level, and sample 76 showed a 96% confidence level of belonging with Tataga-Matau. Sample 101 presented a poor confidence level of 81.5%. Though better than the connection with Lau'agae, this confidence level does not allow assured inclusion of sample 101 with Tataga-Matau.

Discussion

The INAA data suggest the residents of Aganoa Village utilized lithic material from four, possibly five, quarries (Table 5.5). There is a change in pattern through time. Samples match with Lau'agae and Tataga-Matau with a high degree of confidence. These samples are from all three time periods. Three other quarries are represented at Aganoa Village that are not included in the quarry baseline originally created by Johnson et al. (2007). Provenance for these data can only be determined with further research in the location and INAA characterization of more quarries. The implications for these findings are discussed in the next chapter.

Table 5.5. Aganoa Data Numbered Out to Identify Quarry Based on Cultural Period. Quarries 1-3 are unidentified quarries

Cultural Period	Tataga-Matau	Lau'agae	Quarry 1	Quarry 2	Quarry 3
I	0	7	13	11	0
II	1	24	1	2	1
III	1	13	0	12	5
Total	2	44	14	25	6

Analysis of the samples based on the type of artifact showed nothing conclusive (Figure 5.18). Lau'agae sourced artifacts represented all the types of artifacts used. Quarry 1 is only represented by flakes. The other two noted quarries are mostly flakes with some rejuvenation flakes, an adze, and a core.

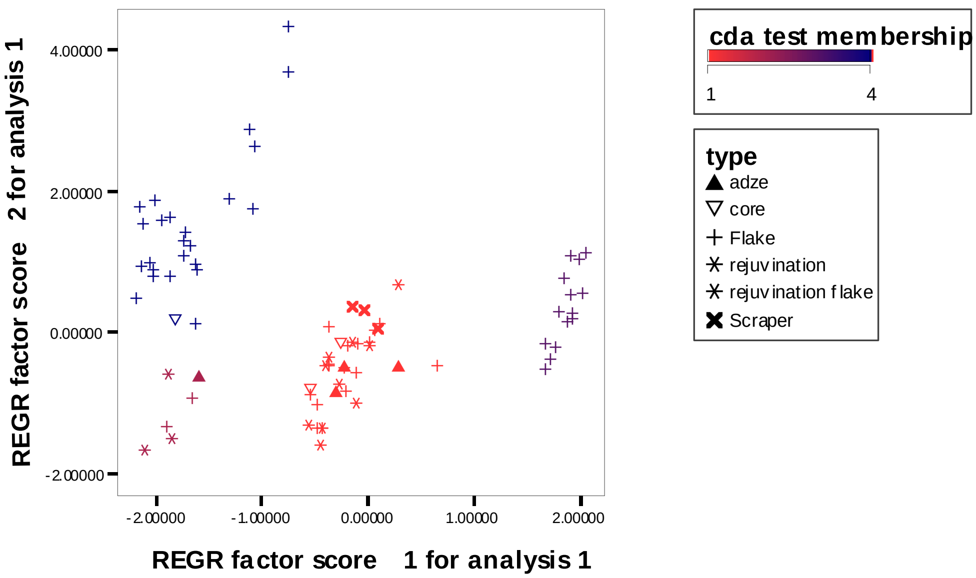

Figure 5.18. Scatterplot of factor scores 1 and 2 with artifact type represented.

CHAPTER VI

SUMMARY AND CONCLUSIONS

There are four major findings that this research offers Samoan archaeology. Aganoa Village (AS-22-43) appears not to be a workshop, but rather a residential site spanning a large amount of time over which adzes were imported and scrapers were probably manufactured on site and used for various domestic activities. Unusual forms and potentially new types of tools to be included in the archaeological Samoan tool kit have been identified at Aganoa Village. The lithic assemblage has also shown differences in the tool kit based on time, which has possible implications for subsistence strategies of the earliest settlers of Samoa. Finally, the INAA results show the importation of lithic materials from other villages that implies certain interactions between Aganoa Village and other areas of Tutuila.

Resulting from the morphological data collected from the analysis of the Aganoa Village lithic assemblage many questions appear. Moore and Kennedy (2003) concluded that Aganoa Village was the site of a lithic workshop. This conclusion was based primarily on surface survey and the collection of a high amount of debitage. The large-scale excavation performed during the summer of 2006 provided no evidence to confirm this claim. On the contrary, my analysis of the lithic assemblage from the latest excavation showed that beneath the surface the amount of debitage is small when compared to the amounts taken from workshop sites on Tutuila such as Alega.

Another argument against the idea that Aganoa Village was a lithic workshop is the lack of polishing stones. Unlike Tataga-Matau, where a large boulder with impressions was found near a stream and closer to the ocean is found the Leone polishing area, Aganoa Village produced no evidence of any polishing activities going on in the vicinity.

The presence of rejuvenation flakes in the assemblage gives further credence to my conclusion about this site not being a workshop. A rejuvenation flake is representative of reworking a completed adze that has most likely been broken. These flakes were removed from this very tough basalt to make the tool viable again. This kind of conservation and recycling of material would not be taking place at a workshop where tools, even if they are in a perform state, should be abundant. Instead, the presence of such rejuvenation/recycling efforts indicates that the lithic material preferred for tools was not easy to come by, thus forcing the residents of Aganoa Village to reshape and reuse tools already in their possession.

The excavation at Aganoa Village recovered some unusual tool forms. The presence of scraper combination tools that have the attributes of two separate established types indicates that the Samoan lithic tool kit is more diverse than previously thought. The combination of a classic coconut grater (Type Ia) and a blade-like tool (Type V) has appeared on four occasions in the assemblage. An odd type of adze was also recovered. Artifact #939-1 has a morphology that does not ascribe to any known adze type. While the presence of one such adze is interesting, it does not imply the immediate inclusion of a new type of adze to the established typology. Further, since the artifact was recovered from the earliest cultural period, it could be a type foreign to Samoa prior to and discontinued since people began settling on Tutuila.

The analysis of the lithic assemblage showed a complete lack of scrapers or flake tools in the earliest cultural period. This period dates to the time of the initial occupation of Tutuila. It can be concluded, based on the lithic evidence, that the earliest inhabitants of Aganoa Village relied less on agricultural subsistence strategies than the later villagers had since they had no stone tools with which to process the goods. Instead, they might have relied on marine food resources that were abundant in the nearby reef. However, this conclusion must be checked with further evidence. It has previously been assumed that the settlers of Samoa brought with them the art of agriculture. The evidence from Aganoa Village suggests otherwise.

The results of the statistical analyses of the Instrumental Neutron Activation Analysis performed on samples from the lithic assemblage from Aganoa confirms that the baseline quarry data established by Johnson et al. (2007) is applicable to residential sites on Tutuila. The data show that the villagers of Aganoa's past utilized tools made from stone that originated at the Lau'agae Quarry and the Tataga-Matau Quarry. Three other sources of tool-stone were identified that did not coincide with the four quarries that have currently been analyzed in the database, while two of the quarries, Alega and Asiapa, were not utilized by Aganoa villagers.

It can be seen that, at least in later times, the residents of Aganoa Village were able to gain lithic materials from Tataga-Matau on the other side of the island of Tutuila. However, it has also shown that the nearer quarry, Lau'agae, was the preferred source.

It is not clear whether villagers had to travel to Tataga-Matau to get the material or if traders from the region of Tataga-Matau would travel around the island exchanging their goods, either in the form of cobble, blank, preform, or completed adze. This scenario is possible considering the expertise with which the Samoans managed ocean travel. The canoes they used were capable not only of traveling the coastline of the island but also traveling over the open ocean between islands and island groups.

The use of Principal Components Analysis, K-Means Cluster Analysis, and Canonical Discriminant Analysis can be used in the steps provided to test the results of INAA analysis of lithic assemblages in Samoa and possibly the rest of Polynesia. While the results will vary for sites further away from Tutuila, the results for a site on the island will prove useful to studies on lithic trade.

The implications for chiefly control of lithic resources can neither be confirmed nor denied by the results of these data. It can be confirmed, however, that the residents of Aganoa had a connection with the village of Lau'agae for the duration of the occupation of Aganoa. It can also be plausible that relations with another village were once good and deteriorated through time.

The true mix of samples from different cultural periods at the site does not show a widening of quarry use through time as originally expected. But, the conclusion that five quarries were used throughout the occupation of the area can be made. Trends can be seen in the preference of quarries did change between the three cultural periods. Figure 6.1 shows the Aganoa data plotting the factor scores of the PCA.

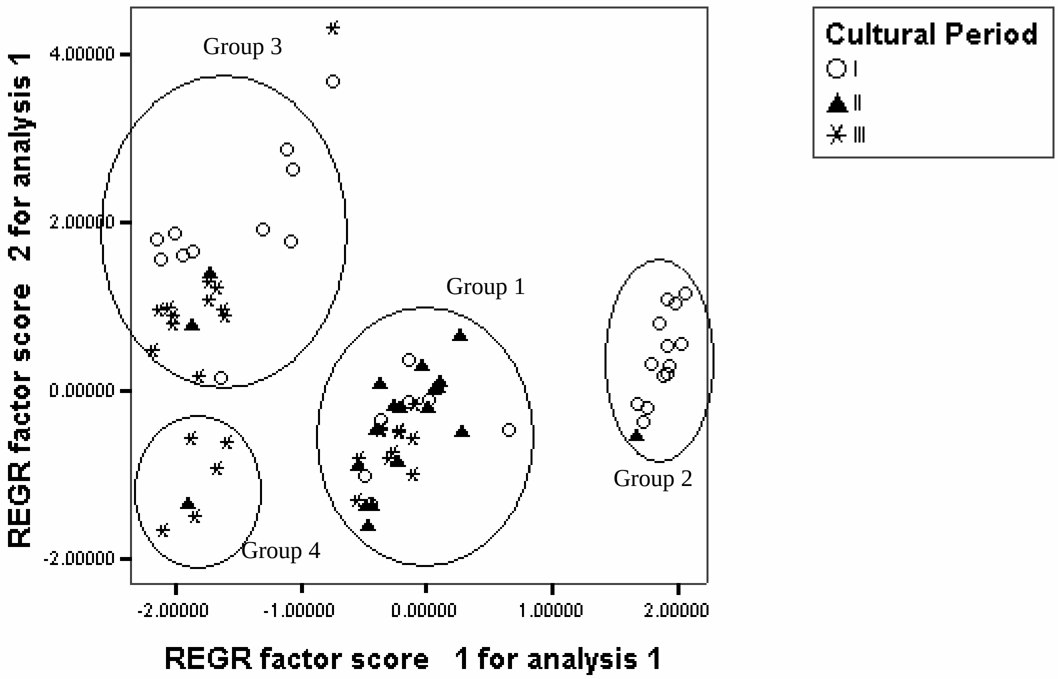

Figure 6.1. Scatterplot of factor factor scores 1 & 2 for Aganoa data detailing cultural periods I, II, and III. Group 1 represents Lau'agae Quarry. Groups 2-4 are from unknown quarries.

Cultural Period I utilized three quarries one being the nearby Lau'agae. Cultural Period II shows use of all four quarries represented in the assemblage. The exceptions are the clear drop in the use of the quarry in Group 2 and the initial use of the Group 4 quarry. The third Cultural Period discussed continued the use of Lau'agae, possibly Tataga-Matau. Two of the samples that appear to have originated at the Tataga-Matau Quarry come from this Cultural Period. The other sample is from Cultural Period II.

The main difference for Cultural Period III is the discontinued use of the Group 2 quarry. This once popular source for tool-stone could have been exhausted by this time, or relations with the *matai* of that village might have become strained and trade was no longer an option.

Conclusions

Based on the above evidence, I can confidently conclude that Aganoa Village (AS-22-43) was not a lithic workshop. It might have witnessed lithic working in the later periods of prehistory; however, excavations shown little evidence to support the workshop claim. Also, the changes in the tool kit between the Cultural Periods I and III show a possible change in subsistence strategies conducted at the site. Cultural Period I showed signs of relying more heavily on marine food sources based on the lack of scrapers and flake tools that are used in processing agricultural goods

This conclusion, however, needs further evidence to be stated with absolute confidence. There is a good possibility that the early villagers used shell material instead of basalt to make tools that would process agricultural goods. An analysis of the shell artifacts recovered from Aganoa will shed more light on this subject.

The results from INAA show that the residents of Aganoa Village utilized at least five quarries. This list includes two samples from the large quarry of Tataga-Matau. Unfortunately, the dates for these samples are not available so comparison with the findings of Leach and Witter (1985, 1990) are not possible. The quarry most used by Aganoa villagers was Lau’agae, a short distance away to the east. Three other quarries were noted but not identified as the data did not match with the baseline. This problem can be easily overcome with the sampling and testing of more quarries on Tutuila, many of which have been surveyed but not excavated.

Changes through time in the utilization of different quarries show trends in quarry use. There is a clear switch from one quarry in Cultural Period I that was not used in Cultural Period III. As well, there is another quarry that was used by Cultural Period III but not by Cultural Period I. The third unidentified quarry was utilized in all three cultural periods. Cultural Period II meanwhile utilized the Lau'agae Quarry primarily.

These data show signs of interaction between the residents of Aganoa Village and the villages that are the sources of the tool-stone. These interactions changed as time carried on. Whether this was motivated by kinship ties, economic preferences, or chiefly disputes or alliances cannot be ascertained at this time, but, it does show that Aganoa Village was active in the area and on the island of Tutuila, American Samoa.

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APPENDIX A

ADZES AND BIFACIAL TOOLS

Artifact #	Class	Length (mm)
939-1	?	107.75
1029-1	III	90.52
332-1	IV	81.46
667-1	I	113.34
1118-1	Reworked I/ Distal end missing	73.54
978-1	Fragment V/ Proximal end missing	60.69
749-2	Reworked I/ Distal end missing	56.41
15-1	Reworked VIII/ Distal end missing	69.06
23-5	Fragment VII/ Distal end missing	37.35
1154-2	Reworked adze/Distal end missing	42.15
332-2	Adze Fragment/ Distal end missing	60.26
870-1	Medial Adze Fragment (VI, VIII)	38.43
13-1	Medial adze Fragment (VI, VIII)	57.08
197-4	Medial Adze Fragment (V)	35.97
53-1	Medial Adze Fragment (II)	58.48
197-3	Medial Adze Fragment (IV, V)	33.48
163-4	Medial Adze Fragment	30.54
23-2	Rounded adze/ pounder	61.27
127-3	Chopper	667.67
127-6	Core/ Multidirectional	556.83
155-1	Core/Adze Preform Fragment	51.52
1159-1	Multidirectional Core/Adze Preform Fragment	65.44
127-13	adze fragment, both ends missing	36.18

Artifact #	Width Distal	Width Proximal	Maximum Width	Weight	Color
939-1	39.26	16.19	39.26	115.62	5y 5/1
1029-1	33.19	22.23	33.19	59.5	5y 5/1
332-1	38.94	22.33	38.94	68.84	5y 5/1
667-1	50.43	27.2	50.43	190.14	5y 4/1
1118-1	29.84	19.49	29.84	49	7.5y 5/1
978-1	47.94		49.3	113.34	5y 5/1
749-2	29.55	23.42	29.55	54.14	5y 5/1
15-1	27.99	18.82	27.99	52.78	10yr 4/2
23-5		24.04	32.72	42.88	7.5yr 5/0
1154-2			40.15	52.8	10y 5/1
332-2		33.96	37.7	106.08	5y 5/1
870-1			34.87	39.28	7.5y 5/1
13-1			35.65	74.98	7.5y 6/1
197-4			63.06	100.94	7.5y 6/1
53-1			39.79	88.8	N 5/0
197-3			58.08	335.34	10yr 5/2
163-4			48.96	37.54	5.2yr 6/0
23-2	31.95	12.9	39.5	82.76	2.5y 6/3
127-3			55.74	101.86	2.5yr 4/0
127-6			47.22	79	2.5yr 4/0
155-1			55.08	97.72	5y 5/1
1159-1			55.18	207.8	5y 5/1
127-13			25.96	17.24	2.5yr 5/0

Artifact #	Cortex	Polish %
939-1	0	<25
1029-1	0	>75
332-1	0	>50
667-1	0	<50
1118-1	0	>75
978-1	0	<50
749-2	0	>50
15-1	y	0
23-5	0	>75
1154-2	0	>50
332-2	0	<25
870-1	0	100
13-1	0	<25
197-4	0	>75
53-1	0	<25
197-3	0	>50
163-4	y	0
23-2	y	0
127-3	y	0
127-6	0	0
155-1	0	0
1159-1	0	0
127-13	0	<25

APPENDIX B

FLAKE TOOLS

Artifact #	Class	Length	Width Distal	Width Proximal	Weight
163-1	Ia	62.47	36.62	15.32	49.38
513-1	IA/V	64.51	37.12	23.62	51.84
150-2	Ib fragment		32.83		11.02
150-1	Ia/V	63.97	42.77	26.38	63.76
141-1	Ib	56.36	32.22	29.54	56.4
1160-1	Chisel	87.7	52.92	29.11	124.38
160-2	V	55.27	84.8	57.18	126.64
681-1	Ib	29.33	16.86	16.26	4.46
781-1	Ia/V	46.36	42.06	13.43	19.7
432-2	Ib fragment		29.93		12.98
456-2	IV	49.14	21.64	27.24	49.46
332-12	IX	39.4	2.61	22.56	7.72
32-1	Ia	46.9	41.68	17.72	35.06
167-1	Ia	61.27	41.38	24.51	58.6
132-1	Ia	47.67	39.21	31.13	33.12
161-4	Ib	38.33	31.34	27.44	20.18
129-1	IV	48.81	42.05	27.21	53.74
166-1	Utilied flake	29.52	33.72		67.66
161-5	Ia	41.44	38.4	28.39	29.52
680-1	V	68.11	32.67	25.88	71.52
677-1	IV	54.41	33.66	23.95	61.62
18-2	Ib	64.28	34.68	25.03	59.88
127-7	X fragment		28.55		21.74
1158-1	Ib	56.07	30.48	21.77	25.1
785-5	Ia	47.44	34.13	18.4	27.38
477-1	IIIb	41.26	37.33	31.55	21.14
18-1	IIIa	60.47	29.75	17.25	25.66
140-7	V	38.23	48.32	20.98	30.72
170-1	Ia fragment		38.79		29.64
1156-1	X	57.15	36.87	22.11	57.76
1112-1	Ia	39.57	36.54	23.05	24.28
1154-1	VI	50.96	8.07	31.15	22.72
191-3	Ib	56.22	28.04		31.8
437-22	IA/V	31.13	34.55	21.12	11.78
456-1	V	71.29	5.18	24.25	49.16
191-2	VII	59.01	19.81	14.31	19.12
1152-1	VII	64.44	6.46	19.43	22.88
163-2	VII	60.27	4.67	19.64	10.78

164-1	Ib/possible core	44.25	34.51		44.96
785-3	Ia fragment	39.74		24.52	40.04
1127-1	Ia fragment	39.46		49.26	42.6
1194-1	Unknown	45.69	7.89	22.87	21.9
256-3	Unknown	38.8	65.17		34.96

Artifact #	Color	Cortex	Dorsal scars
163-1	5y 5/1	N	1
513-1	7.5y 4/1	N	1
150-2	7.5y 5/1	N	4+
150-1	5y 4/1	N	2
141-1	2.5y 3/1	Y-ventral and dorsal	0
1160-1	2.5y 5/1	Y- dorsal face	4+
160-2	2.5y 4/1	Y- dorsal face	3
681-1	7.5y 5/1	N	4+
781-1	5y 5/1	N	3
432-2	7.5y 5/1	N	2
456-2	7.5y 5/1	y-ventral face	4+
332-12	2.5gy 5/1	Y- dorsal face	0
32-1	5y 4/1	N	4+
167-1	5y 4/1	y-side	3
132-1	10y 5/1	N	3
161-4	2.5y 4/1	Y	3
129-1	10y 4/1	Y	4+
166-1	5y 5/1	N	4
161-5	5y 4/1	N	1
680-1	5y 4/1	N	0
677-1	5y 4/1	Y- dorsal face	4+
18-2	7.5y 5/1	N	4+
127-7	5y 5/1	N (polished)	0
1158-1	5y 5/1	N	2
785-5	N 3/0	Y- dorsal face	2
477-1	5y 4/1	N	1
18-1	7.5y 5/1	N	4+
140-7	5y 4/1	N	4+
170-1	2.5gy 4/1	N	3
1156-1	7.5gy 4/1	N	4+
1112-1	5y 5/1	N	1
1154-1	5y 5/1	N	4+
191-3	5y 5/1	N	4+
437-22	5y 6/1	N	1
456-1	5y 5/1	N	3
191-2	5y 5/1	Y- dorsal face	2
1152-1	10y 5/1	N	3
163-2	7.5y 4/1	N	3
164-1	7.5yr 4/0	N	4+
785-3	2.5y 4/0	N	3

1127-1	2.5yr 6/0	N	3
1194-1	10yr 6/0	N	4+
256-3	2.5yr 5/0	Y- dorsal face	2

APPENDIX C

DEBITAGE

Artifact #	Class	Color	Condition	Impact	Terminatio n
113-1	flake	2.5yr 4/0	Complete	hertzian	feathered
1056-7	flake	5y 5/1	fragment	bending	feathered
1056-1	flake	5yr 5/2	fragment	bending	feathered
1056-14	flake	5y 6/1	fragment	hertzian	unknown
1056-9	flake	5y 5/1	complete	bending	feathered
1056-12	flake	5y 5/1	fragment	hertzian	feathered
1056-6	flake	5y 5/1	fragment	unknown	unknown
1056-8	flake	5y 5/1	fragment	hertzian	feathered
1056-10	flake	5y 5/1	complete	hertzian	feathered
1056-3	flake	5y 5/1	fragment	hertzian	feathered
1056-2	rejuvination flake	5y 5/1	complete	hertzian	feathered
1056-4	rejuvination flake	5y 5/1	Complete	hertzian	hinged
1056-5	flake	5y 5/1	Complete	hertzian	stepped
1056-11	flake	5y 5/1	Complete	hertzian	feathered
1056-13	flake	5y 5/1	fragment	hertzian	feathered
1056-15	flake	5y 5/1	Complete	hertzian	feathered
1056-16	angular shatter	5y 5/1	Complete	unknown	feathered
1056-17	flake	5y 5/1	Complete	hertzian	stepped
1056-18	micro				
1056-19	micro				
1056-20	micro				
1056-21	micro				
1056-22	micro				
1056-23	micro				
1056-24	micro				
1056-25	micro				
1056-26	micro				
1056-27	micro				
1056-28	micro				
1056-29	micro				
1056-30	micro				
1056-31	micro				
1056-32	micro				
1056-33	micro				
1056-34	micro				
1056-35	micro				
1056-36	micro				
1056-37	micro				
1056-38	micro				
1056-39	micro				
1056-40	micro				

1056-41	micro				
1056-42	micro				
1056-43	micro				
1056-44	micro				
1056-45	micro				
422-1	flake	2.5yr 4/0	fragment	hertzian	feathered
191-1	flake	7.5yr 4/0	complete	hertzian	stepped
191-4	rejuvination flake	2.5y 4/2	Complete	bending	feathered
191-5	core	2.5yr 4/0	fragment	unknown	unknown
191-6	flake	2.5yr 4/0	Complete	hertzian	stepped
191-7	flake	2.5y 5/0	fragment	bending	feathered
191-8	rejuvination flake	2.5y 5/0	Complete	hertzian	feathered
191-9	utilized flake	2.5yr 4/0	fragment	hertzian	feathered
191-12	flake	2.5yr 4/0	fragment	bending	feathered
260-1	flake	7.5yr 4/0	fragment	hertzian	feathered
209-1	flake	5y 5/1	fragment	hertzian	unknown
209-2	flake	5y 5/1	fragment	hertzian	feathered
209-3	angular shatter	5y 5/1	fragment	unknown	feathered
209-4	flake	2.5y 6/1	Complete	hertzian	feathered
209-5	flake	2.5y 6/1	fragment	hertzian	feathered
209-6	angular shatter				
209-7	flake	5y 5/1	Complete	hertzian	stepped
209-8	angular shatter				
209-9	flake	5y 5/1	Complete	hertzian	feathered
209-10	flake	5y 6/2	Complete	bending	feathered
209-11	micro				
209-12	micro				
209-13	micro				
209-14	micro				
237-1	angular shatter	2.5y 5/2	Complete	hertzian	stepped
237-2	flake	5y 6/1	Complete	hertzian	feathered
237-3	flake	5y 4/1	Complete	bending	feathered
237-4	angular shatter	7.5y 5/2	Complete		
237-5	flake	2.5y 5/1	Complete	hertzian	stepped
237-6	flake	7.5y 5/1	Complete	hertzian	feathered
237-7	angular shatter	2.5yr 3/4	Complete	unknown	feathered
237-8	flake	5y 5/1	fragment	hertzian	feathered
237-9	flake	7.5y 5/1	fragment	hertzian	feathered
237-10	flake	10y 5/1	Complete	bending	feathered
237-11	flake	5y 4/1	fragment	hertzian	feathered
237-12	flake	5y 5/1	fragment	unknown	feathered
237-13	angular shatter	5y 5/2	Complete	hertzian	feathered
237-14	flake	5y 5/1	fragment	hertzian	stepped
959-2	flake	10yr 4/1	Complete	hertzian	overshot
959-3	flake	10yr 4/2	Complete	hertzian	feathered
959-4	flake	n 3/0	fragment	unknown	unknown
959-5	flake	5y 4/1	Complete	hertzian	hinged
959-6	flake	5y 4/1	Complete	hertzian	feathered

959-8	flake	5y 4/1	Complete	hertzian	feathered
959-10	micro				
216-1	flake	5yr 4/2	fragment	hertzian	unknown
216-2	flake	2.5gy 4/1	fragment	hertzian	feathered
21-1	angular shatter	7.5yr 5/2	Complete	unknown	unknown
21-2	flake	2.5y 4/1	Complete	hertzian	stepped
21-3	flake	2.5y 5/1	Complete	bending	feathered
21-4	rejuvination flake	2.5y 5/1	Complete	hertzian	feathered
21-5	rejuvination flake	2.5y 5/1	Complete	hertzian	feathered
21-6	flake	2.5y 4/1	fragment	bending	feathered
21-7	rejuvination flake	2.5y 5/1	Complete	hertzian	stepped
21-8	rejuvination flake	2.5y 4/1	Complete	hertzian	feathered
21-9	flake	2.5y 5/1	Complete	bending	feathered
21-10	flake	2.5y 4/1	complete	hertzian	feathered
21-11	angular shatter	2.5y 5/2	complete	hertzian	feathered
21-12	rejuvination flake	2.5y 5/1	complete	hertzian	stepped
21-13	rejuvination flake	2.5y 6/1	complete	bending	feathered
21-14	flake	2.5y 5/1	complete	bending	feathered
21-15	flake	2.5y 4/1	complete	hertzian	feathered
21-16	rejuvination flake	2.5y 5/1	complete	bending	hinged
21-17	flake	2.5y 5/1	complete	hertzian	feathered
21-18	angular shatter	2.5y 7/1	complete	unknown	feathered
21-19	rejuvination flake	2.5y 5/1	fragment	hertzian	feathered
21-20	flake	2.5y 5/1	Complete	hertzian	feathered
21-21	rejuvination flake	2.5y 5/1	Complete	hertzian	feathered
21-22	angular shatter	7.5yr 8/0	Complete	unknown	feathered
21-23	flake	5y 5/1	fragment	unknown	feathered
21-24	flake	10yr 6/1	fragment	unknown	unknown
21-25	angular shatter	10yr 5/1	fragment	unknown	stepped
21-26	flake	10yr 5/1	fragment	unknown	unknown
21-27	flake	7.5yr 5/0	complete	bending	feathered
21-28	flake	2.5yr 5/0	complete	bending	stepped
21-29	flake	7.5yr 5/0	complete	hertzian	feathered
21-30	angular shatter	10yr 5/1	complete	unknown	feathered
21-31	rejuvination flake	2.5yr 5/0	complete	bending	feathered
21-32	flake	7.5yr 5/0	fragment	hertzian	feathered
21-33	flake	2.5y 5/0	complete	bending	hinged
21-34	micro			bending	
21-35	micro			bending	feathered
21-36	micro			bending	stepped
1037-2	flake	7.5yr 5/0	complete	hertzian	feathered
1037-3	flake	5y 5/1	complete	hertzian	feathered
1037-4	flake	7.5yr 5/0	complete	hertzian	feathered
1037-5	micro				
1037-6	micro				
1037-7	micro				
487-1	flake	10y 5/1	fragment	unknown	feathered
487-2	flake	5y 5/1	fragment	bending	feathered

487-3	angular shatter	2.5y 4/0	fragment	unknown	unknown
487-4	angular shatter	10y 5/1	Complete		
487-6	angular shatter	5y 5/1	Complete		
487-7	angular shatter	10yr 5/1	Complete		
487-8	angular shatter	7.5yr 8/0	Complete		
487-9	angular shatter	10yr 5/1	Complete		
487-10	angular shatter				
17-1	flake	2.5yr 5/0	Complete	bending	stepped
144-1	flake	7.5yr 5/0	Complete	bending	stepped
280-1	flake	2.5y 6/0	Complete	hertzian	feathered
1027-10	flake	10yr 5/1	fragment	unknown	feathered
1027-13	flake	7.5yr 5/0	Complete	hertzian	feathered
1027-18	flake	7.5yr 5/0	Complete	hertzian	feathered
1027-20	flake	10yr 6/1	Complete	hertzian	feathered
1027-22	flake	10yr 6/1	Complete	hertzian	feathered
1027-25	flake	10yr 5/1	Complete	hertzian	stepped
1027-7	rejuvination flake	10yr 5/1	Complete	hertzian	feathered
1027-28	flake	2.5yr 5/0	Complete	hertzian	feathered
1027-17	flake	7.5yr 6/0	fragment	unknown	feathered
1027-16	angular shatter	10yr 5/1	Complete	unknown	feathered
1027-45	flake	7.5yr 6/0	Complete	hertzian	stepped
1027-32	angular shatter	10yr 5/1	Complete	unknown	feathered
1027-34	angular shatter	10yr 6/1	fragment	unknown	feathered
1027-35	rejuvination flake	10yr 5/1	fragment	unknown	feathered
1027-21	flake	10yr 6/1	Complete	hertzian	stepped
1027-36	flake	10yr 5/1	fragment	hertzian	unknown
1027-39	flake	10yr 6/1	fragment	bending	feathered
1027-8	flake	10yr 6/1	Complete	hertzian	feathered
1027-12	flake	10yr 5/1	fragment	bending	feathered
1027-29	angular shatter	10yr 5/1	Complete	unknown	feathered
1027-44	rejuvination flake	10yr 6/1	Complete	hertzian	feathered
1027-9	flake	7.5yr 5/0	Complete	hertzian	feathered
1027-26	flake	10yr 5/1	fragment	hertzian	feathered
1027-4	flake	7.5yr 6/0	Complete	bending	feathered
1027-42	flake	10yr 6/1	Complete	hertzian	feathered
1027-43	flake	10yr 6/1	Complete	hertzian	feathered
1027-24	flake	7.5yr 5/0	Complete	bending	feathered
1027-41	flake	10yr 6/1	fragment	unknown	feathered
1027-38	flake	10yr 6/1	fragment	hertzian	feathered
1027-14	flake	7.5yr 6/0	Complete	hertzian	feathered
1027-9	flake	7.5yr 6/0	Complete	hertzian	feathered
1027-19	flake	7.5yr 6/0	Complete	bending	feathered
1027-40	flake	7.5yr 6/0	Complete	hertzian	feathered
1027-31	flake	10yr 6/1	Complete	hertzian	feathered
1027-37	flake	7.5yr 6/0	Complete	hertzian	feathered
1027-11	flake	7.5yr 6/0	fragment	hertzian	feathered
1027-27	rejuvination flake	7.5yr 5/0	Complete	hertzian	feathered
1027-30	flake	7.5yr 6/0	fragment	hertzian	feathered

1027-18	flake	7.5yr 6/0	Complete	hertzian	feathered
1027-33	flake	10yr 6/1	Complete	bending	feathered
1027-15	flake	10yr 5/1	fragment	bending	feathered
1027-23	flake	7.5yr 5/0	Complete	hertzian	feathered
776-1	flake	2.5y 4/0	Complete	bending	stepped
886-1	flake	2.5y 6/0	Complete	hertzian	feathered
930-1	flake	2.5y 6/0	Complete	hertzian	feathered
1211-1	flake	7.5yr 5/0	fragment	hertzian	feathered
1211-2	flake	7.5yr 5/0	Complete	bending	feathered
670-2	flake	7.5yr 5/0	Complete	hertzian	feathered
670-3	flake	7.5yr 5/0	Complete	hertzian	feathered
720-1	flake	7.5yr 6/0	Complete	bending	feathered
720-2	flake	7.5yr 5/0	Complete	hertzian	feathered
720-3	flake	7.5yr 5/0	Complete	hertzian	feathered
720-4	flake	7.5yr 5/0	fragment	bending	unknown
938-1	flake	white	Complete	hertzian	feathered
938-2	flake	2.5yr 6/0	Complete	hertzian	feathered
938-3	flake	10yr 6/1	Complete	hertzian	feathered
938-4	angular shatter	10yr 6/1	Complete	unknown	feathered
938-5	flake	10yr 5/1	Complete	hertzian	feathered
938-6	flake	10yr 6/1	Complete	hertzian	feathered
938-7	flake	7.5yr 6/0	complete	hertzian	feathered
938-8	flake	7.5yr 5/0	complete	hertzian	feathered
938-9	flake	7.5yr 5/0	fragment	hertzian	feathered
938-10	angular shatter	7.5yr 6/0	complete	unknown	feathered
938-11	flake	7.5yr 5/0	complete	hertzian	feathered
938-12	micro				
938-13	micro				
938-14	micro				
938-15	micro				
1177-1	flake	7.5yr 5/0	Complete	bending	feathered
1177-2	flake	7.5yr 5/0	complete	bending	feathered
1049-1	flake	2.5yr 5/0	complete	bending	feathered
1049-2	micro				
1168-1	flake	10yr 6/1	complete	hertzian	feathered
977-1	flake	7.5yr 5/0	complete	hertzian	feathered
977-2	rejuvination flake	7.5yr 5/0	complete	hertzian	feathered
977-3	flake	7.5yr 6/0	complete	bending	feathered
977-4	flake	7.5yr 5/0	complete	hertzian	feathered
977-5	flake	7.5yr 5/0	complete	bending	feathered
706-1	flake	7.5yr 5/0	complete	hertzian	feathered
706-2	micro				
706-3	micro				
706-4	micro				
770-1	flake	2.5yr 4/0	complete	hertzian	feathered
912-1	flake	2.5yr 5/0	complete	hertzian	feathered
1054-1	angular shatter	2.5yr 5/0	fragment	unknown	feathered
1054-2	flake	2.5yr 6/0	complete	hertzian	feathered

1054-3	flake	2.5yr 5/0	fragment	hertzian	feathered
1054-4	flake	2.5yr 5/0	Complete	hertzian	feathered
964-1	flake	2.5yr 4/0	fragment	unknown	feathered
964-2	flake	2.5yr 5/0	Complete	hertzian	feathered
946-3	flake	7.5yr 6/0	fragment	hertzian	feathered
964-4	flake	2.5yr 5/0	Complete	hertzian	feathered
807-1	flake	7.5yr 6/0	fragment	hertzian	feathered
807-2	flake	10yr 5/1	fragment	hertzian	unknown
807-3	flake	7.5yr 5/0	Complete	hertzian	feathered
807-4	angular shatter	10yr 6/1	Complete	unknown	feathered
807-5	micro				
1044-1	angular shatter	10yr 5/1	fragment	unknown	feathered
1044-2	flake	7.5yr 6/0	Complete	hertzian	feathered
1044-3	flake	7.5yr 4/0	fragment	bending	feathered
1044-4	flake	10yr 5/1	Complete	hertzian	feathered
1044-5	flake	10yr 5/1	Complete	hertzian	feathered
1044-6	flake	10yr 6/1	Complete	hertzian	feathered
1188-1	flake	7.5yr 5/0	fragment	unknown	feathered
1188-2	flake	7.5yr 4/0	fragment	unknown	feathered
1188-3	flake	7.5yr 5/0	fragment	unknown	feathered
1188-4	flake	7.5yr 5/0	fragment	unknown	unknown
1085-1	flake	7.5yr 5/0	Complete	bending	feathered
1122-1	flake	7.5yr 5/0	Complete	hertzian	feathered
1122-2	flake	7.5yr 5/0	Complete	bending	feathered
1122-3	flake	7.5yr 5/0	Complete	hertzian	feathered
1061-1	flake	7.5yr 5/0	fragment	unknown	feathered
1061-2	flake	7.5yr 5/0	fragment	unknown	feathered
1061-3	flake	10yr 5/1	Complete	hertzian	feathered
1061-4	flake	7.5yr 4/0	fragment	hertzian	feathered
1061-5	flake	7.5yr 6/0	fragment	hertzian	unknown
1061-6	flake	7.5yr 6/0	Complete	hertzian	feathered
1061-7	flake	7.5yr 5/0	Complete	hertzian	feathered
1061-8	flake	7.5yr 5/0	fragment	hertzian	unknown
1061-9	flake	7.5yr 5/0	fragment	hertzian	feathered
1061-10	flake	7.5yr 5/0	fragment	bending	unknown
1061-11	flake	7.5yr 5/0	fragment	unknown	unknown
1061-12	flake	7.5yr 5/0	Complete	bending	stepped
1061-13	micro				
1173-1	flake	2.5yr 5/0	fragment	unknown	feathered
1173-2	flake	2.5yr 4/0	fragment	hertzian	unknown
1137-1	flake	7.5yr 5/0	Complete	bending	feathered
794-1	rejuvination flake	7.5yr 5/0	Complete	hertzian	feathered
794-2	flake	7.5yr 5/0	Complete	hertzian	feathered
794-3	flake	7.5yr 5/0	Complete	hertzian	feathered
1010-1	flake	7.5yr 4/0	Complete	bending	feathered
1010-2	flake	7.5yr 4/0	Complete	bending	feathered
1079-1	flake	10yr 5/1	Complete	bending	feathered
1165-1	flake	7.5yr 5/0	Complete	bending	feathered

1165-2	flake	7.5yr 5/0	fragment	hertzian	feathered
796-2	flake	10yr 6/1	Complete	bending	feathered
1069-1	flake	2.5yr 5/0	Complete	hertzian	feathered
1069-2	flake	2.5yr 4/0	fragment	unknown	feathered
1069-3	flake	2.5yr 4/0	Complete	bending	feathered
1069-4	micro				
1069-5	micro				
1140-1	flake	7.5yr 5/0	fragment	unknown	feathered
1140-2	flake	7.5yr 5/0	fragment	unknown	unknown
1140-3	flake	5yr 4/1	fragment	hertzian	unknown
1140-5	flake	5yr 4/1	fragment	unknown	feathered
1140-4	flake	5yr 4/1	Complete	bending	feathered
1140-6	micro				
785-1	flake	7.5yr 4/0	Complete	hertzian	feathered
785-2	flake	7.5yr 3/2	Complete	hertzian	feathered
785-4	rejuvination flake	7.5yr 4/0	Complete	hertzian	feathered
664-1	flake	10yr 6/1	Complete	hertzian	feathered
656-1	flake	7.5yr 5/0	Complete	hertzian	stepped
656-2	flake	7.5yr 5/0	Complete	hertzian	feathered
656-3	flake	7.5yr 5/0	fragment	hertzian	unknown
656-4	rejuvination flake	7.5yr 5/0	Complete	bending	feathered
656-5	flake	5y 5/1	Complete	hertzian	feathered
656-6	flake	7.5yr 6/0	fragment	hertzian	unknown
735-1	flake	2.5yr 6/0	fragment	unknown	feathered
735-2	flake	10yr 6/1	Complete	bending	feathered
735-3	flake	5yr 5/4	Complete	hertzian	feathered
735-4	angular shatter	10yr 5/1	fragment	unknown	unknown
753-1	angular shatter	7.5yr 6/0	complete	unknown	unknown
753-2	flake	7.5yr 5/0	complete	hertzian	feathered
753-3	angular shatter	7.5yr 5/0	complete	unknown	feathered
753-4	flake	7.5yr 5/0	complete	unknown	feathered
753-5	flake	7.5yr 5/0	Complete	hertzian	feathered
872-1	flake	7.5yr 5/0	Complete	bending	feathered
848-1	angular shatter	7.5yr 3/2	fragment	unknown	feathered
707-1	flake	5yr 4/1	Complete	hertzian	feathered
707-2	flake	5y 5/2	Complete	bending	feathered
707-3	flake	5y 4/1	complete	hertzian	feathered
707-4	flake	5yr 4/1	complete	unknown	feathered
707-5	angular shatter	10yr 6/1	complete	unknown	unknown
698-1	micro				
744-1	flake	7.5yr 6/0	fragment	unknown	feathered
729-1	flake	5y 4/1	complete	hertzian	feathered
761-1	flake	5y 4/1	complete	hertzian	stepped
783-1	flake	2.5yr 4/0	complete	hertzian	feathered
783-2	flake	2.5yr 4/0	fragment	hertzian	unknown
1240-1	flake	2.5yr 3/0	fragment	hertzian	feathered
1240-2	rejuvination flake	2.5yr 4/0	fragment	bending	unknown
1240-3	rejuvination flake	2.5yr 4/0	complete	bending	stepped

1240-4	flake	2.5yr 4/0	fragment	hertzian	unknown
1185-1	flake	5y 5/2	complete	hertzian	feathered
800-1	flake	10yr 4/1	fragment	hertzian	unknown
800-2	angular shatter	10yr 4/1	complete	unknown	feathered
800-3	flake	10yr 4/1	fragment	unknown	feathered
975-1	flake	7.5yr 5/0	Complete	hertzian	feathered
821-1	angular shatter	10yr 4/1	Complete	unknown	unknown
843-1	angular shatter	10yr 5/1	Complete	unknown	unknown
843-2	flake	10yr 4/1	Complete	hertzian	feathered
890-1	rejuvination flake	7.5yr 5/0	Complete	hertzian	feathered
869-1	angular shatter				
1113-1	flake	7.5yr 4/0	fragment	hertzian	unknown
1132-2	flake	2.5yr 4/0	fragment	hertzian	feathered
115-1	angular shatter	2.5yr 6/4			
95-1	rejuvination flake	2.5yr 5/0	fragment	bending	unknown
23-1	angular shatter	10yr 5/2			
23-3	angular shatter	7.5yr 5/0			
23-4	flake	7.5yr 4/0	Complete	hertzian	feathered
23-6	flake	7.5yr 5/0	fragment	bending	feathered
23-7	flake	7.5yr 5/0	fragment	hertzian	feathered
806-1	flake	5yr 3/1	Complete	hertzian	feathered
692-1	flake	7.5yr 4/0	fragment	hertzian	feathered
760-1	flake	10yr 5/1	fragment	hertzian	feathered
760-3	flake	7.5yr 5/0	Complete	hertzian	feathered
720-4	micro				
781-3	flake	7.5yr 4/0	fragment	hertzian	unknown
781-4	angular shatter	7.5yr 5/0			
781-5	flake	2.5yr 5/0	Complete	bending	feathered
78-1	angular shatter				
78-2	angular shatter				
78-3	angular shatter				
53-2	angular shatter				
53-3	angular shatter				
40-2	flake	5yr 5/1	Complete	bending	feathered
40-3	flake	7.5yr 4/0	Complete	hertzian	feathered
40-4	flake	7.5yr 5/0	Complete	hertzian	feathered
40-5	flake	2.5yr 5/0	fragment	unknown	feathered
40-6	rejuvination flake	2.5yr 5/0	fragment	hertzian	unknown
32-2	rejuvination flake	2.5yr 4/0	Complete	bending	feathered
32-3	angular shatter				
32-4	angular shatter				
32-5	flake	2.5yr 4/0	fragment	bending	feathered
18-3	angular shatter				
18-4	angular shatter				
18-5	angular shatter				
18-6	angular shatter				
18-7	angular shatter				
18-8	angular shatter				

18-9	angular shatter				
18-10	angular shatter				
18-11	angular shatter				
322-3	flake	2.5yr 3/0	Complete	hertzian	feathered
322-4	flake	2.5yr 3/0	Complete	hertzian	feathered
322-5	flake	2.5yr 3/0	fragment	bending	unknown
322-6	flake	2.5yr 6/0	Complete	bending	feathered
322-7	flake	7.5yr 4/6	Complete	hertzian	feathered
322-8	flake	2.5yr 6/0	fragment	bending	feathered
322-9	flake	7.5yr 4/0	Complete	hertzian	feathered
322-11	flake	7.5yr 4/0	Complete	hertzian	feathered
322-12	micro				
322-13	flake	7.5yr 4/0	Complete	bending	feathered
314-1	flake	7.5yr 4/0	Complete	hertzian	feathered
314-2	flake	7.5yr 4/0	Complete	hertzian	feathered
314-3	flake	7.5yr 3/0	Complete	hertzian	feathered
248-2	flake	7.5yr 4/0	fragment	hertzian	feathered
274-1	flake	7.5yr 4/0	Complete	bending	feathered
140-3	flake	2.5yr 4/0	Complete	bending	feathered
140-4	angular shatter				
140-5	flake	2.5yr 4/0	fragment	bending	feathered
140-6	flake	2.5yr 4/0	fragment	hertzian	unknown
140-8	flake	2.5yr 5/0	fragment	hertzian	unknown
140-9	flake	2.5yr 4/0	Complete	hertzian	stepped
132-3	rejuvination flake	10yr 5/1	fragment	bending	unknown
132-2	rejuvination flake	2.5yr 4/0	fragment	unknown	feathered
132-4	rejuvination flake	2.5yr 4/0	fragment	hertzian	feathered
132-5	flake	10yr 5/1	fragment	hertzian	unknown
132-6	flake	10yr 5/1	fragment	hertzian	unknown
132-7	flake	7.5yr 4/0	fragment	bending	unknown
132-8	flake	10yr 5/1	Complete	bending	feathered
132-9	flake	5yr 4/1	Complete	hertzian	stepped
132-10	flake	2.5yr 4/0	Complete	hertzian	feathered
132-11	flake	2.5yr 5/0	fragment	hertzian	unknown
132-12	flake	2.5yr 4/0	Complete	bending	feathered
132-13	flake	2.5yr 4/0	fragment	hertzian	feathered
132-14	flake	2.5yr 4/0	Complete	bending	feathered
132-15	flake	5y 4/1	Complete	hertzian	feathered
132-16	flake	2.5yr 4/0	fragment	bending	feathered
132-17	flake	2.5yr 4/0	Complete	hertzian	feathered
112-1	flake	2.5yr 4/0	Complete	hertzian	feathered
112-2	flake	2.5yr 5/0	Complete	hertzian	feathered
112-3	flake	2.5yr 4/0	fragment	unknown	feathered
112-5	flake	2.5yr 5/0	fragment	hertzian	feathered
112-6	flake	2.5yr 4/0	Complete	bending	stepped
160-1 f	flake	5y 5/1	Complete	hertzian	feathered
283-1	flake	5y 3/1	fragment	bending	feathered
283-2	flake	5y 3/1	Complete	hertzian	feathered

283-3	flake	5y 4/1	Complete	hertzian	feathered
283-4	flake	5y 3/1	Complete	hertzian	feathered
366-1	flake	2.5y 4/0	Complete	hertzian	feathered
366-2	flake	2.5y 3/0	Complete	bending	feathered
366-3	rejuvination flake	2.5y 5/0	Complete	hertzian	feathered
366-4	flake	2.5yr 3/0	fragment	hertzian	feathered
366-5	flake	2.5yr 4/0	Complete	hertzian	feathered
110-1	flake	2.5yr 4/0	Complete	hertzian	feathered
110-2	flake	2.5yr 4/0	Complete	hertzian	feathered
110-3	rejuvination flake	2.5yr 4/0	Complete	hertzian	feathered
110-4	flake	2.5yr 4/0	Complete	hertzian	stepped
110-5	flake	2.5yr 3/0	Complete	hertzian	feathered
82-1	flake	5y 4/1	Complete	hertzian	feathered
82-2	flake	2.5y 4/0	Complete	hertzian	feathered
82-3	flake	2.5y 4/0	Complete	hertzian	feathered
82-4	flake	2.5y 3/0	Complete	bending	feathered
82-5	angular shatter				
75-1	flake	2.5y 4/0	Complete	hertzian	stepped
75-2	flake	2.5y 4/0	Complete	hertzian	feathered
75-3	flake	2.5y 3/0	Complete	hertzian	feathered
75-4	flake	white	fragment	hertzian	unknown
75-5	angular shatter				
75-6	angular shatter				
68-1	flake	2.5y 3/0	Complete	hertzian	feathered
66-1	flake	2.5y 4/0	Complete	hertzian	feathered
66-2	flake	2.5y 4/0	fragment	bending	feathered
66-3	flake	2.5y 3/0	Complete	hertzian	feathered
66-4	flake	2.5y 3/0	Complete	hertzian	feathered
66-5	flake	2.5y 4/0	fragment	unknown	feathered
61-1	flake	2.5y 4/0	Complete	bending	feathered
45-1	core	5y 6/1	Complete	hertzian	feathered
37-1	flake	2.5yr 5/0	fragment	unknown	unknown
37-2	flake	10yr 5/1	Complete	hertzian	feathered
37-3	angular shatter				
37-4	angular shatter				
28-1	flake	2.5y 4/0	Complete	hertzian	feathered
28-2	rejuvination flake	2.5yr 4/0	Complete	hertzian	feathered
28-3	rejuvination flake	2.5yr 4/0	Complete	hertzian	feathered
28-4	rejuvination flake	2.5yr 4/0	Complete	bending	feathered
28-5	flake	2.5yr 4/0	fragment	hertzian	feathered
28-6	flake	2.5yr 4/0	fragment	hertzian	unknown
28-7	flake	2.5yr 5/0	Complete	hertzian	feathered
28-8	flake	2.5yr 3/0	fragment	unknown	feathered
28-9	flake	2.5yr 4/0	fragment	unknown	feathered
28-10	flake	2.5yr 4/0	Complete	hertzian	feathered
28-11	angular shatter				
517-1	flake	2.5y 4/0	fragment	hertzian	unknown
517-2	flake	2.5yr 5/0	Complete	hertzian	feathered

513-2	flake	2.5yr 4/0	Complete	hertzian	feathered
513-3	angular shatter				
513-4	flake	2.5y 5/0	fragment	hertzian	unknown
525-1	rejuvination flake	2.5y 5/0	fragment	bending	unknown
525-2	flake	2.5y 4/2	fragment	hertzian	unknown
525-3	flake	5y 4/1	fragment	hertzian	feathered
525-4	flake	5y 5/1	Complete	hertzian	feathered
629-1	rejuvination flake	5y 3/1	Complete	hertzian	feathered
629-2	angular shatter				
629-3	micro				
629-4	micro				
647-1	angular shatter				
647-2	flake	2.5y 5/0	fragment	bending	unknown
647-3	angular shatter				
647-4	angular shatter				
647-5	micro				
419-1	angular shatter				
419-2	angular shatter				
419-3	flake	2.5yr 4/0	fragment	bending	unknown
419-4	flake	2.5yr 5/0	Complete	hertzian	feathered
419-5	flake	2.5yr 4/0	Complete	hertzian	feathered
419-6	angular shatter				
419-7	flake	5yr 6/1	fragment	unknown	feathered
477-1	flake	2.5y 4/0	fragment	hertzian	feathered
477-2	angular shatter				
477-3	flake	5y 4/1	fragment	unknown	feathered
477-4	angular shatter				
477-5	angular shatter				
477-6	angular shatter				
477-7	angular shatter				
477-8	flake	5y 4/1	Complete	hertzian	feathered
477-9	flake	5y 5/1	Complete	hertzian	feathered
459-1	flake	2.5y 4/0	Complete	hertzian	feathered
459-2	angular shatter				
459-3	angular shatter				
459-4	angular shatter				
459-5	angular shatter				
441-1	flake	2.5y 4/0	Complete	hertzian	feathered
441-2	flake	2.5y 5/0	Complete	hertzian	feathered
441-3	flake	2.5y 4/0	Complete	hertzian	feathered
437-5	flake	2.5y 5/0	fragment	bending	unknown
437-31	angular shatter				
437-15	angular shatter				
437-22	angular shatter				
437-11	flake	5y 5/1	Complete	hertzian	feathered
437-3	flake	2.5yr 5/0	fragment	unknown	feathered
437-9	angular shatter				
437-28	angular shatter				

437-14	flake	5y 5/1	fragment	hertzian	feathered
437-23	angular shatter				
437-18	angular shatter				
437-26	flake	5y 4/1	fragment	unknown	feathered
437-1	angular shatter				
437-21	angular shatter				
437-19	angular shatter				
437-9	angular shatter				
437-12	angular shatter				
437-13	angular shatter				
437-30	angular shatter				
437-8	angular shatter				
437-29	flake	2.5y 5/0	Complete	hertzian	feathered
437-6	angular shatter				
437-7	angular shatter				
437-17	angular shatter				
437-27	angular shatter				
437-24	angular shatter				
437-10	angular shatter				
437-16	flake	2.5y 3/0	fragment	bending	unknown
437-2	flake	2.5y 5/0	Complete	hertzian	feathered
437-20	rejuvination flake	2.5y 5/0	fragment	hertzian	unknown
194-2	flake	2.5yr 4/0	Complete	hertzian	feathered
194-3	flake	5yr 3/1	fragment	hertzian	unknown
194-1	angular shatter				
194-5	angular shatter				
194-4	angular shatter				
222-1	angular shatter				
222-2	angular shatter				
222-3	micro				
255-2	flake	2.5y 5/0	Complete	hertzian	feathered
255-3	flake	2.5y 5/0	fragment	hertzian	unknown
255-4	flake	2.5y 5/0	fragment	hertzian	unknown
287-1	flake	5y 5/1	fragment	hertzian	unknown
737-1	flake	2.5y 4/0	fragment	hertzian	feathered
737-2	rejuvination flake	2.5y 5/0	Complete	bending	feathered
737-3	flake	2.5y 5/0	Complete	hertzian	feathered
737-4	flake	2.5y 5/0	fragment	hertzian	feathered
731-1	rejuvination flake	5y 3/1	fragment	hertzian	unknown
731-2	flake	2.5y 4/0	fragment	hertzian	unknown
731-3	angular shatter				
731-4	flake	2.5y 5/0	fragment	unknown	unknown
749-1	rejuvination flake	2.5y 5/0	Complete	hertzian	feathered
713-2	flake	2.5y 4/0	Complete	bending	feathered
713-5	flake	2.5y 3/0	fragment	unknown	feathered
713-3	flake	2.5y 4/0	fragment	hertzian	feathered
713-4	flake	2.5y 4/0	fragment	hertzian	unknown
563-1	angular shatter				

563-2	rejuvination flake	2.5y 5/0	Complete	bending	feathered
563-3	angular shatter				
571-1	angular shatter				
571-2	micro				
571-3	micro				
571-4	micro				
603-1	angular shatter				
581-1	rejuvination flake	2.5y 5/0	Complete	hertzian	feathered
581-2	flake	2.5y 5/0	fragment	hertzian	feathered
405-1	flake	2.5yr 5/0	Complete	hertzian	feathered
432-1	angular shatter				
468-1	flake	2.5yr 5/0	Complete	hertzian	feathered
472-1	flake	2.5yr 5/0	fragment	hertzian	feathered
472-2	flake	2.5y 4/0	fragment	hertzian	unknown
349-1	rejuvination flake	2.5y 5/0	Complete	bending	feathered
332-8	flake	5y 5/1	fragment	hertzian	unknown
332-5	flake	2.5y 5/0	fragment	unknown	feathered
332-11	flake	2.5y 6/0	Complete	bending	feathered
332-3	flake	2.5y 4/2	Complete	hertzian	feathered
332-4	flake	2.5y 4/0	Complete	hertzian	feathered
332-6	flake	2.5y 5/2	Complete	hertzian	feathered
332-7	angular shatter				
332-9	angular shatter				
332-10	flake	2.5y 5/0	Complete	hertzian	feathered
332-12	flake	2.5y 5/0	fragment	hertzian	unknown
332-14	flake	2.5y 5/2	Complete	hertzian	feathered
332-15	flake	2.5y 5/0	Complete	hertzian	feathered
266-1	flake	5y 4/1	fragment	hertzian	unknown
266-2	angular shatter				
266-3	flake	5y 4/1	Complete	hertzian	feathered
266-4	flake	5y 4/1	Complete	hertzian	feathered
266-5	flake	5y 4/1	fragment	hertzian	feathered
266-6	flake	5y 4/1	Complete	hertzian	feathered
266-7	flake	5y 4/1	Complete	hertzian	feathered
266-8	flake	5y 4/1	fragment	unknown	unknown
266-9	flake	5y 4/1	fragment	bending	feathered
266-10	angular shatter				
266-11	flake	5y 4/1	Complete	hertzian	feathered
266-12	angular shatter				
266-13	flake	5y 4/1	fragment	hertzian	unknown
266-14	flake	5y 4/1	fragment	hertzian	feathered
266-15	flake	7.5yr 4/2	fragment	hertzian	unknown
266-16	flake	5y 4/1	Complete	hertzian	feathered
266-17	angular shatter				
266-18	flake	5y 4/1	Complete	bending	feathered
266-19	flake	5y 4/1	fragment	hertzian	feathered
266-20	flake	5y 4/1	Complete	hertzian	feathered
266-21	flake	5y 4/1	fragment	unknown	feathered

266-22	angular shatter				
266-23	flake	10yr 6/1	fragment	unknown	feathered
266-24	flake	5y 4/1	fragment	hertzian	unknown
266-25	angular shatter				
266-26	flake	5y 4/1	Complete	hertzian	hinged
266-27	flake	10yr 5/1	fragment	unknown	feathered
266-28	flake	5y 4/1	Complete	bending	feathered
266-29	flake	10yr 5/1	Complete	hertzian	feathered
163-5	flake	2.5y 5/0	fragment	hertzian	unknown
163-6	rejuvination flake	2.5y 5/0	Complete	hertzian	feathered
163-7	flake	2.5y 5/0	fragment	unknown	feathered
163-8	flake	2.5y 5/0	fragment	unknown	feathered
163-9	angular shatter				
168-10	flake	2.5y 4/0	Complete	bending	feathered
163-11	flake	2.5y 5/0	fragment	hertzian	unknown
163-13	flake	5y 4/1	fragment	unknown	unknown
163-14	angular shatter				
163-15	flake	2.5y 5/0	fragment	hertzian	feathered
163-16	rejuvination flake	2.5y 4/0	Complete	hertzian	feathered
163-17	flake	2.5y 5/0	fragment	hertzian	unknown
163-18	angular shatter				
163-19	angular shatter				
161-1	flake	2.5y 3/0	fragment	bending	feathered
161-2	angular shatter				
161-3	angular shatter				
280-1	Flake	2.5y 6/0	Complete	hertzian	feathered
1027-6	Flake	10yr 7/1	Complete	hertzian	hinged
1027-5	Flake	10yr 6/1	Complete	hertzian	feathered
1027-3	Flake	10yr 7/1	Complete	hertzian	feathered
1027-2	Flake	10yr 7/1	Complete	bending	feathered
1027-1	Flake	10yr 6/1	Complete	bending	hinged
1191-1	Flake	2.5yr 5/0	fragment	hertzian	feathered
1085-2	Flake	2.5yr 5/0	complete	bending	feathered
82-1	Flake	2.5yr 4/0	fragment	hertzian	hinged
1140-6	rejuvination flake	5y 4/1	Complete	bending	feathered
1140-7	Flake	5y 5/1	fragment	hertzian	feathered
977-1	Flake	7.5yr 5/0	Complete	bending	feathered
75-1	Flake	7.5yr 4/0	Complete	hertzian	feathered
1207-1	Flake	7.5yr 5/0	Complete	hertzian	feathered
1173-1	rejuvination flake	2.5yr 5/0	Complete	hertzian	feathered
720-1	Flake	2.5yr 5/0	fragment	bending	feathered
964-1	Flake	2.5yr 6/0	fragment	hertzian	feathered
1061-1	Flake	5y 4/1	fragment	bending	feathered
1061-2	Flake	5y 5/1	Complete	hertzian	feathered
1061-3	Flake	7.5yr 4/0	Complete	bending	feathered
343-1	Flake	2.5yr 4/0	Complete	hertzian	feathered
322-1	Flake	2.5yr 4/0	fragment	bending	feathered
322-2	Flake	2.5yr 4/0	Complete	hertzian	feathered

322-6	Flake	2.5yr 4/0	Complete	bending	feathered
1044-7	Flake	2.5yr 5/0	fragment	unknown	feathered
964-2	Flake	5y 5/1	Complete	hertzian	hinged
720-2	Flake	2.5y 5/0	fragment	bending	feathered
82-2	Flake	2.5y 4/0	Complete	bending	feathered
508-1	Flake	2.5yr 4/0	fragment	hertzian	unknown
127-14	Flake	2.5yr 4/0	Complete	bending	hinged
127-8	rejuvination flake	2.5yr 4/0	Complete	bending	feathered
255-1	Flake	7.5yr 5/0	Complete	hertzian	hinged
761-1	Flake	2.5yr 5/0	Complete	bending	feathered
248-1	Flake	7.5yr 5/0	Complete	hertzian	feathered
163-3	shatter	5y 5/1	Complete	wedged	feathered
796-1	core	5y 2.5/1	Complete	unknown	feathered
456-4	Flake	5y 5/1	Complete	hertzian	feathered
456-3	Flake	5y 5/1	Complete	hertzian	feathered
456-8	core	5y 4/1	Complete	unknown	feathered
456-7	Flake	5y 4/1	Complete	hertzian	feathered
1151-1	Flake	5y 4/1	Complete	hertzian	feathered
456-6	Flake	5y 5/1	Complete	hertzian	overshot
1153-2	Flake	2.5yr 4/0	Complete	hertzian	feathered
456-13	Flake	5y 5/1	Complete	hertzian	feathered
456-5	Flake	5y 5/1	Complete	hertzian	feathered
140-1	rejuvination flake	7.5yr 5/0	Complete	bending	feathered
279-1	Flake	7.5yr 5/0	Complete	hertzian	hinged
140-2	Flake	2.5yr 4/0	fragment	hertzian	unknown
112-4	Flake	7.5yr 4/0	fragment	hertzian	feathered
243-1	Flake	2.5yr 4/0	Complete	hertzian	feathered
560-1	Flake	2.5yr 5/0	Complete	hertzian	feathered
737-1	rejuvination flake	2.5y 5/0	fragment	bending	feathered
437-25	shatter	5y 6/1	Complete	unknown	unknown
656-1	Flake	2.5y 4/0	Complete	hertzian	stepped
781-2	Flake	2.5y 5/0	Complete	hertzian	feathered
1132-1	Flake	2.5y 5/0	Complete	hertzian	feathered
629-1	Flake	5y 5/1	Complete	bending	stepped
470-1	Flake	2.5y 4/0	Complete	hertzian	feathered
332-13	flake	2.5y 5/0	Complete	hertzian	feathered
615-1	flake	2.5y 6/0	Complete	hertzian	feathered
670-1	rejuvination flake	2.5y 5/0	Complete	bending	hinged
713-5	rejuvination flake	2.5y 4/0	Complete	bending	feathered
575-1	Flake	7.5yr 5/0	Complete	hertzian	feathered
794-2	rejuvination flake	2.5y 5/0	Complete	hertzian	feathered
1155-1	rejuvination flake	5y 4/1	Complete	hertzian	hinged
676-1	Flake	2.5y 4/0	Complete	hertzian	feathered
1153-1	Flake	2.5y 4/0	Complete	hertzian	feathered
794-1	rejuvination flake	2.5y 5/0	Complete	bending	feathered
666-1	rejuvination flake	2.5y 4/2	Complete	bending	overshot
456-12	Flake	5y 5/1	Complete	wedged	feathered
456-11	Flake	5y 4/1	Complete	bending	hinged

456-16	Flake	5y 5/1	Complete	bending	feathered
456-14	Flake	5y 4/1	Complete	hertzian	feathered
456-9	Flake	5y 4/1	Complete	hertzian	feathered
456-10	Flake	5y 4/1	Complete	hertzian	feathered
456-15	Flake	5y 4/1	Complete	hertzian	feathered
713-1	Flake	7.5yr 5/0	fragment	hertzian	feathered

Artifact #	Platform prep	Length	Width	length V Width	Thickness
113-1	complex	27.84	39.39	-11.55	7.28
1056-7	flat	48.43	91.29	-42.86	6.9
1056-1	flat	20.66	55.21	-34.55	8.83
1056-14	complex	16.51	18.93	-2.42	4.61
1056-9	complex	16.8	25.35	-8.55	5.71
1056-12	complex	17.31	16.87	0.44	3.71
1056-6	unknown	16.96	19.73	-2.77	7.8
1056-8	complex	11.34	17.03	-5.69	2.99
1056-10	complex	20.76	14.64	6.12	2.94
1056-3	complex	17.39	20.94	-3.55	4.65
1056-2	flat	11.9	14.19	-2.29	3.27
1056-4	flat	24.43	15.69	8.74	2.33
1056-5	flat	17.09	13.19	3.9	2.47
1056-11	flat	20.24	19.11	1.13	3.81
1056-13	flat	15.75	13.65	2.1	3.16
1056-15	flat	15.2	11.01	4.19	2.07
1056-16	unknown	9.69	10.99	-1.3	4.35
1056-17	flat	11.56	17.22	-5.66	3.55
1056-18		0.1	0.1	0	0.1
1056-19		0.1	0.1	0	0.1
1056-20		0.1	0.1	0	0.1
1056-21		0.1	0.1	0	0.1
1056-22		0.1	0.1	0	0.1
1056-23		0.1	0.1	0	0.1
1056-24		0.1	0.1	0	0.1
1056-25		0.1	0.1	0	0.1
1056-26		0.1	0.1	0	0.1
1056-27		0.1	0.1	0	0.1
1056-28		0.1	0.1	0	0.1
1056-29		0.1	0.1	0	0.1
1056-30		0.1	0.1	0	0.1
1056-31		0.1	0.1	0	0.1
1056-32		0.1	0.1	0	0.1
1056-33		0.1	0.1	0	0.1
1056-34		0.1	0.1	0	0.1
1056-35		0.1	0.1	0	0.1
1056-36		0.1	0.1	0	0.1

1056-37		0.1	0.1	0	0.1
1056-38		0.1	0.1	0	0.1
1056-39		0.1	0.1	0	0.1
1056-40		0.1	0.1	0	0.1
1056-41		0.1	0.1	0	0.1
1056-42		0.1	0.1	0	0.1
1056-43		0.1	0.1	0	0.1
1056-44		0.1	0.1	0	0.1
1056-45		0.1	0.1	0	0.1
422-1	flat	7.91	10.36	-2.45	2.95
191-1	complex	15.97	19.48	-3.51	3.44
191-4	flat	16.68	21.1	-4.42	0.46
191-5	unknown	0.1	0.1	0	0.1
191-6	complex	7.33	10.55	-3.22	4.82
191-7	complex	29.18	18.65	10.53	3.68
191-8	flat	8.88	12.09	-3.21	2.32
191-9	unknown	35.18	40.72	-5.54	6.33
191-12	complex	49.33	32.29	17.04	11.84
260-1	flat	10.12	15.55	-5.43	2.42
209-1	complex	27.61	31.31	-3.7	6.67
209-2	complex	15.35	14.1	1.25	2.81
209-3	unknown	12.63	16.8	-4.17	4.35
209-4	flat	18.39	18.67	-0.28	5.2
209-5	flat	21.86	17.99	3.87	4.2
209-6		0.1	0.1	0	0.1
209-7	complex	15.43	15.59	-0.16	3.73
209-8		0.1	0.1	0	0.1
209-9	complex	34.64	21.25	13.39	6.16
209-10	flat	11.42	26.19	-14.77	3.32
209-11		0.1	0.1	0	0.1
209-12		0.1	0.1	0	0.1
209-13		0.1	0.1	0	0.1
209-14		0.1	0.1	0	0.1
237-1	flat	23.67	12.52	11.15	5.24
237-2	flat	28.03	65.11	-37.08	10.04
237-3	complex	16.93	14.15	2.78	4.97
237-4		0.1	0.1	0	0.1
237-5	complex	13.05	9.11	3.94	3.19
237-6	complex	26.19	23.69	2.5	5.74
237-7	flat	14.27	14.31	-0.04	2.91
237-8	complex	16.62	10.65	5.97	2.01
237-9	flat	22.63	18.2	4.43	6.96
237-10	complex	22.31	15.34	6.97	2.68
237-11	complex	21	23.05	-2.05	6.94
237-12	unknown	0.1	0.1	0	0.1
237-13	complex	11.43	13.17	-1.74	3.01
237-14	complex	17.28	38.04	-20.76	3.78
959-2	complex	27.22	38.41	-11.19	12.26

959-3	flat	20.19	23.58	-3.39	3.61
959-4	unknown	13.6	42.03	-28.43	12.35
959-5	flat	23.84	32.74	-8.9	8.47
959-6	complex	59.66	52.79	6.87	9.61
959-8	flat	15.45	21.83	-6.38	4.26
959-10		0.1	0.1	0	0.1
216-1	complex	31.11	30.06	1.05	8.09
216-2	flat	21.27	16.45	4.82	3.85
21-1	flat	52.42	32.86	19.56	13.77
21-2	flat	31.6	29.64	1.96	4.79
21-3	complex	18.75	22.99	-4.24	5.12
21-4	flat	16.14	23.52	-7.38	3.7
21-5	flat	17.35	29.01	-11.66	9.27
21-6	complex	21.11	7.87	13.24	5.29
21-7	flat	19.79	21.51	-1.72	5.49
21-8	flat	17.71	31.68	-13.97	6.81
21-9	flat	16.72	19.65	-2.93	4.75
21-10	complex	17.78	14.92	2.86	3.44
21-11	complex	19.26	19.83	-0.57	4.26
21-12	flat	16.49	22.86	-6.37	3.2
21-13	flat	25.01	35.44	-10.43	12.42
21-14	flat	25.13	30.64	-5.51	4.68
21-15	complex	15.31	17.51	-2.2	2.85
21-16	flat	12.52	16.32	-3.8	3.67
21-17	complex	23.6	27.01	-3.41	5.73
21-18	unknown	29.43	22.55	6.88	3.55
21-19	complex	16.62	20.76	-4.14	5.91
21-20	complex	12.05	23.78	-11.73	8.04
21-21	complex	13.53	13.42	0.11	2.52
21-22	flat	31.22	25.89	5.33	5.92
21-23	unknown	37.38	32.43	4.95	10.32
21-24	unknown	10.88	16.18	-5.3	2.76
21-25	unknown	26.23	23.02	3.21	5.2
21-26	unknown	19.45	29.28	-9.83	3.73
21-27	flat	26.62	13.62	13	5.36
21-28	complex	12.45	16.08	-3.63	2.53
21-29	flat	17.29	13.3	3.99	1.29
21-30	unknown	17.75	9.42	8.33	2.71
21-31	flat	18.21	12.17	6.04	6.21
21-32	flat	18.91	17.53	1.38	5
21-33	flat	17.55	30.36	-12.81	4.06
21-34		0.1	0.1	0	0.1
21-35		0.1	0.1	0	0.1
21-36		0.1	0.1	0	0.1
1037-2	flat	18.3	21.66	-3.36	2.78
1037-3	flat	11.16	22.18	-11.02	5.37
1037-4	flat	12.73	18.63	-5.9	4.11
1037-5		0.1	0.1	0	0.1

1037-6		0.1	0.1	0	0.1
1037-7		0.1	0.1	0	0.1
487-1	unknown	33.17	19.17	14	4.34
487-2	complex	31.43	25.43	6	5.01
487-3	unknown	0.1	0.1	0	0.1
487-4		32.28	42.42	-10.14	7.11
487-6		24.74	26.49	-1.75	5.95
487-7		23.54	112.33	-88.79	4.95
487-8		26.57	17.19	9.38	2.37
487-9		23.01	15.38	7.63	2.34
487-10		0.1	0.1	0	0.1
17-1	flat	31.75	42.81	-11.06	7.79
144-1	complex	24.57	22.61	1.96	4.75
280-1	complex	29.51	34.11	-4.6	8.05
1027-10	unknown	22.8	16.43	6.37	4.01
1027-13	flat	12.87	10.9	1.97	2.41
1027-18	complex	24.32	15.35	8.97	2.7
1027-20	flat	14.05	11.37	2.68	1.53
1027-22	complex	32.11	24.33	7.78	4.4
1027-25	complex	19.19	17.61	1.58	4.57
1027-7	complex	12.23	13.47	-1.24	1.87
1027-28	flat	19.23	24.84	-5.61	2.02
1027-17	unknown	16.27	13.79	2.48	4.54
1027-16	unknown	19.48	17.76	1.72	3.35
1027-45	complex	22.55	20.61	1.94	5.34
1027-32	unknown	11.2	21.96	-10.76	4.93
1027-34	unknown	15.56	9.84	5.72	2.41
1027-35	unknown	12.93	11.86	1.07	1.64
1027-21	flat	16.51	17.45	-0.94	2.16
1027-36	complex	10.84	17.44	-6.6	2.93
1027-39	flat	16.56	12.12	4.44	2.39
1027-8	complex	21.42	25.55	-4.13	3.91
1027-12	complex	23.73	16.55	7.18	4.58
1027-29	unknown	16.22	12.5	3.72	2.8
1027-44	flat	15.51	7.91	7.6	2.37
1027-9	complex	15.68	16.13	-0.45	2.77
1027-26	complex	16.96	16.36	0.6	3.39
1027-4	complex	36.1	37.04	-0.94	6.04
1027-42	flat	15.77	23.13	-7.36	3.8
1027-43	flat	18.81	13.38	5.43	4.13
1027-24	complex	15.49	9.51	5.98	2.14
1027-41	unknown	15.56	7.69	7.87	2.72
1027-38	complex	14.71	22.19	-7.48	3.26
1027-14	complex	23.52	25.18	-1.66	3.54
1027-9	complex	19.25	13.47	5.78	4.1
1027-19	flat	11.89	16.58	-4.69	3.03
1027-40	complex	8.1	12.49	-4.39	1.85
1027-31	complex	17.39	19.39	-2	3.15

1027-37	complex	23.64	10.41	13.23	3.5
1027-11	complex	20.9	14.78	6.12	3.69
1027-27	complex	21.09	9.99	11.1	2.52
1027-30	complex	13.21	18.48	-5.27	3.16
1027-18	flat	13.78	18.03	-4.25	5.47
1027-33	flat	15.42	16.13	-0.71	2.24
1027-15	complex	13.96	17.99	-4.03	2.36
1027-23	complex	18.02	22.36	-4.34	2.81
776-1	flat	11.85	11.52	0.33	2.53
886-1	complex	14.74	17.06	-2.32	3.36
930-1	complex	16.5	12.19	4.31	1.42
1211-1	complex	32.79	25.42	7.37	3.62
1211-2	flat	13.6	12.97	0.63	3.26
670-2	complex	64.7	53.82	10.88	12.15
670-3	complex	15.29	16.55	-1.26	3.77
720-1	complex	13.96	20.43	-6.47	4.54
720-2	flat	19.65	24.54	-4.89	5.46
720-3	complex	12.53	9.84	2.69	2.47
720-4	complex	11	13.82	-2.82	3.11
938-1	complex	45.43	31.15	14.28	12.49
938-2	flat	25.34	26.48	-1.14	4.95
938-3	complex	9.72	12.7	-2.98	3.02
938-4	unknown	14.15	20.23	-6.08	4.91
938-5	flat	24.8	27.19	-2.39	4.38
938-6	complex	30.32	11.65	18.67	4.48
938-7	complex	32.04	45.54	-13.5	6.6
938-8	complex	20.82	18.02	2.8	5.95
938-9	complex	21.65	18.7	2.95	4.38
938-10	unknown	20.91	28.16	-7.25	5.34
938-11	flat	24.5	49.67	-25.17	5.12
938-12		0.1	0.1	0	0.1
938-13		0.1	0.1	0	0.1
938-14		0.1	0.1	0	0.1
938-15		0.1	0.1	0	0.1
1177-1	complex	22.22	18.37	3.85	4.36
1177-2	complex	20	17.1	2.9	3.46
1049-1	complex	17.49	18.7	-1.21	2.74
1049-2		0.1	0.1	0	0.1
1168-1	flat	29.16	26.92	2.24	3.73
977-1	flat	14.17	7.36	6.81	3.02
977-2	flat	10.79	12.38	-1.59	1.68
977-3	flat	10.82	18.96	-8.14	3.35
977-4	complex	8.4	23.64	-15.24	4.3
977-5	complex	28.48	20.14	8.34	4.24
706-1	complex	23.9	29.64	-5.74	4
706-2		0.1	0.1	0	0.1
706-3		0.1	0.1	0	0.1
706-4		0.1	0.1	0	0.1

770-1	flat	9.9	14.21	-4.31	2.36
912-1	flat	14.7	8.31	6.39	1.23
1054-1	unknown	6.7	12.72	-6.02	2.39
1054-2	complex	10.5	11.11	-0.61	0.88
1054-3	complex	13.04	15.26	-2.22	1.78
1054-4	flat	18.69	15.33	3.36	4.38
964-1	unknown	22.34	22.91	-0.57	3.79
964-2	flat	25.58	17.29	8.29	6.44
946-3	unknown	16.33	23.65	-7.32	3.66
964-4	flat	21.21	25.14	-3.93	6.68
807-1	complex	16.36	29	-12.64	4.5
807-2	flat	8.81	13.96	-5.15	2.51
807-3	complex	31.62	20.77	10.85	7.74
807-4	unknown	43.67	29.27	14.4	9.72
807-5		0.1	0.1	0	0.1
1044-1	unknown	7.41	11.47	-4.06	1.92
1044-2	complex	9.25	14.58	-5.33	3.14
1044-3	flat	11.53	10.29	1.24	1.61
1044-4	flat	19.86	26.3	-6.44	4.42
1044-5	flat	17.89	16.08	1.81	2.91
1044-6	complex	21.11	19.37	1.74	2.06
1188-1	unknown	12.63	14.81	-2.18	3.54
1188-2	unknown	9.95	9.35	0.6	2.95
1188-3	unknown	11.64	11.72	-0.08	1.91
1188-4	unknown	13.37	18.8	-5.43	2.34
1085-1	flat	37.32	19.88	17.44	4.97
1122-1	complex	16.72	8.83	7.89	1.56
1122-2	complex	15.74	19.32	-3.58	2.15
1122-3	flat	24.72	10.97	13.75	3.44
1061-1	unknown	8.66	9.86	-1.2	1.86
1061-2	unknown	10.49	10.15	0.34	2.26
1061-3	flat	11.32	14.56	-3.24	2.23
1061-4	flat	13.5	14.8	-1.3	4.88
1061-5	flat	13.64	16.52	-2.88	2.03
1061-6	complex	13.78	15.74	-1.96	3.17
1061-7	unknown	15.38	21.51	-6.13	4.83
1061-8	complex	22.37	21.43	0.94	6.52
1061-9	complex	26.17	24.2	1.97	7.68
1061-10	complex	24.6	26.45	-1.85	3.25
1061-11	unknown	30.83	22.23	8.6	5.62
1061-12	complex	14.08	29.07	-14.99	6.71
1061-13		0.1	0.1	0	0.1
1173-1	unknown	21.09	25.67	-4.58	3.47
1173-2	complex	30.65	20.11	10.54	4.42
1137-1	flat	14.22	15.75	-1.53	4.75
794-1	complex	19.39	17.98	1.41	6.23
794-2	complex	20.97	15.3	5.67	3.8
794-3	complex	16.67	24.18	-7.51	6.11

1010-1	flat	17.59	13.84	3.75	5.67
1010-2	complex	16.3	14.09	2.21	4.12
1079-1	complex	28.14	19.45	8.69	2.18
1165-1	flat	19.26	24	-4.74	4.38
1165-2	flat	34.42	24.28	10.14	5.62
796-2	complex	15.63	32.3	-16.67	5.74
1069-1	complex	56.38	62.08	-5.7	7.11
1069-2	unknown	21.52	19.23	2.29	4.33
1069-3	complex	29.26	19.36	9.9	5.06
1069-4		0.1	0.1	0	0.1
1069-5		0.1	0.1	0	0.1
1140-1	unknown	11.19	9.83	1.36	2.6
1140-2	unknown	28.56	33.15	-4.59	4.39
1140-3	complex	21.57	27.61	-6.04	4.98
1140-5	unknown	13.33	24.9	-11.57	2.57
1140-4	complex	24.53	12.77	11.76	4.94
1140-6		0.1	0.1	0	0.1
785-1	complex	8.57	17.04	-8.47	1.91
785-2	complex	14.8	20.98	-6.18	8.8
785-4	complex	27.56	45.95	-18.39	6.69
664-1	flat	22.29	24.08	-1.79	5.71
656-1	complex	43.14	50.39	-7.25	8.32
656-2	complex	11.94	14.14	-2.2	3.91
656-3	complex	14.39	16.93	-2.54	1.85
656-4	complex	12.32	13.66	-1.34	2.79
656-5	flat	15.5	24.78	-9.28	4.54
656-6	flat	22.65	19.99	2.66	4.1
735-1	unknown	20.72	39.52	-18.8	5.37
735-2	complex	14.47	35.55	-21.08	10.67
735-3	complex	35.01	15.59	19.42	5.54
735-4	unknown	39.51	33.54	5.97	7.06
753-1	unknown	22.53	26.98	-4.45	6.62
753-2	complex	17.61	23.87	-6.26	5.38
753-3	unknown	23.21	15.23	7.98	8.02
753-4	unknown	16.04	18.97	-2.93	6.15
753-5	flat	30.07	54.6	-24.53	11.67
872-1	complex	13.79	23.54	-9.75	2.28
848-1	unknown	19.62	25.6	-5.98	3.47
707-1	complex	13.15	23.49	-10.34	5.53
707-2	complex	13.95	17.62	-3.67	3.34
707-3	complex	24.93	24.63	0.3	5.23
707-4	complex	34.33	17.73	16.6	4.36
707-5	unknown	17.17	31.56	-14.39	7.34
698-1		0.1	0.1	0	0.1
744-1	unknown	27.24	23.27	3.97	4.73
729-1	complex	16.06	20.54	-4.48	3.14
761-1	flat	39.95	20.95	19	6.83
783-1	flat	16.52	38.92	-22.4	4.71

783-2	flat	31.11	30.76	0.35	5.66
1240-1	complex	16.87	18.12	-1.25	5.1
1240-2	complex	18.42	25.99	-7.57	4.33
1240-3	complex	9.88	26.12	-16.24	3.94
1240-4	complex	21.58	20.09	1.49	2.93
1185-1	complex	14	23.37	-9.37	2.68
800-1	complex	39.76	53.56	-13.8	6.57
800-2	unknown	18.66	18.22	0.44	5.09
800-3	unknown	16.78	30.12	-13.34	3.9
975-1	flat	7.01	22.12	-15.11	9.89
821-1	unknown	16.13	11.94	4.19	3.08
843-1	unknown	30.18	37.02	-6.84	25.58
843-2	flat	25.08	22.39	2.69	9.03
890-1	complex	36.63	16.09	20.54	6.53
869-1				0	
1113-1	complex	36.61	18.91	17.7	6.18
1132-2	flat	30.11	24.59	5.52	6.75
115-1				0	
95-1	complex	31.48	26.77	4.71	6.3
23-1				0	
23-3				0	
23-4	complex	35.22	32.23	2.99	18.52
23-6	flat	36.03	25.27	10.76	7.94
23-7	flat	43.96	47.08	-3.12	9.96
806-1	flat	13.33	20.82	-7.49	4.5
692-1	complex	42.98	51.28	-8.3	7.21
760-1	complex	23.89	17.76	6.13	3.7
760-3	complex	12.97	17.84	-4.87	3.96
720-4		0.1	0.1	0	0.1
781-3	complex	24.33	18.77	5.56	5.7
781-4				0	
781-5	complex	33.6	23	10.6	4.02
78-1				0	
78-2				0	
78-3				0	
53-2				0	
53-3				0	
40-2	complex	42.68	41.11	1.57	18.12
40-3	flat	37.86	42.99	-5.13	6.47
40-4	complex	45.34	37.12	8.22	8.47
40-5	unknown	23.44	20.2	3.24	4.43
40-6	flat	19.23	21.3	-2.07	5.09
32-2	flat	9.76	20.08	-10.32	5.68
32-3				0	
32-4				0	
32-5	flat	24.11	25.3	-1.19	5.89
18-3				0	
18-4				0	

18-5				0	
18-6				0	
18-7				0	
18-8				0	
18-9				0	
18-10				0	
18-11				0	
322-3	flat	13.7	13.31	0.39	3.71
322-4	complex	30.3	13.11	17.19	6.18
322-5	complex	13.65	18.81	-5.16	4.04
322-6	complex	14.42	29.57	-15.15	8.5
322-7	flat	14.52	12.48	2.04	3.48
322-8	flat	10.35	24.96	-14.61	7.06
322-9	complex	17.92	16.2	1.72	5.07
322-11	complex	14.48	11.2	3.28	5.95
322-12		0.1	0.1	0	0.1
322-13	flat	10.27	12.46	-2.19	1.6
314-1	complex	17.02	24.02	-7	6.2
314-2	complex	23.92	32.28	-8.36	5.73
314-3	complex	32.68	33.41	-0.73	4.68
248-2	flat	12.51	17.19	-4.68	3.25
274-1	complex	9.01	19.48	-10.47	6.79
140-3	complex	14.95	19.4	-4.45	6.93
140-4				0	
140-5	complex	26.32	19.46	6.86	5.37
140-6	complex	21.03	23.37	-2.34	3.35
140-8	complex	19.59	15.97	3.62	3.88
140-9	complex	24.83	20.91	3.92	5.99
132-3	complex	9.96	14.94	-4.98	3.5
132-2	unknown	15.63	10.01	5.62	2.89
132-4	complex	27.25	15.69	11.56	4.92
132-5	flat	14.6	12.34	2.26	3.15
132-6	complex	16.27	13.18	3.09	1.91
132-7	complex	17.01	24.62	-7.61	8.98
132-8	complex	17.21	15.72	1.49	3.6
132-9	flat	16.6	15.69	0.91	4.62
132-10	complex	22.5	19.09	3.41	5.06
132-11	flat	13.87	16.11	-2.24	4.06
132-12	complex	9.48	15.75	-6.27	5.39
132-13	complex	18.38	21.95	-3.57	5.48
132-14	flat	18.18	17.15	1.03	4.56
132-15	flat	20.28	25.88	-5.6	4.83
132-16	flat	15.8	22.9	-7.1	4.83
132-17	complex	19.17	30.21	-11.04	4.43
112-1	complex	15.11	22.66	-7.55	10.82
112-2	complex	11.61	25.06	-13.45	7.74
112-3	unknown	14.24	21.24	-7	3.37
112-5	complex	21.43	27.69	-6.26	6.58

112-6	complex	25.72	25.53	0.19	8.01
160-1 f	complex	36.74	34.62	2.12	8.83
283-1	flat	19.43	16.62	2.81	2.54
283-2	complex	17.64	17.57	0.07	4.69
283-3	flat	11.88	13	-1.12	2.95
283-4	complex	8.55	13.57	-5.02	2.32
366-1	complex	14.04	13.77	0.27	5.23
366-2	complex	22.05	22.36	-0.31	4.54
366-3	complex	19.83	18.65	1.18	1.58
366-4	complex	24.14	16.11	8.03	5.6
366-5	complex	18.16	34.94	-16.78	6.29
110-1	complex	10.37	10.41	-0.04	1.59
110-2	complex	15.3	14.71	0.59	3.85
110-3	complex	14.83	11.29	3.54	2.56
110-4	flat	13.91	18.27	-4.36	4.73
110-5	unknown	16.61	22.64	-6.03	5.62
82-1	flat	9.28	9.06	0.22	2.56
82-2	complex	10.18	14.21	-4.03	3.09
82-3	complex	19.41	17.98	1.43	6.46
82-4	flat	12.66	17.75	-5.09	6.42
82-5				0	
75-1	flat	18.89	15.86	3.03	3.35
75-2	complex	16.79	19.36	-2.57	4.78
75-3	flat	26.9	35.86	-8.96	5.27
75-4	complex	20	19.94	0.06	5.8
75-5				0	
75-6				0	
68-1	flat	8.84	10.22	-1.38	1.93
66-1	complex	9.5	12.44	-2.94	2.46
66-2	complex	15.95	14.59	1.36	3.66
66-3	complex	15.27	12.57	2.7	2.15
66-4	flat	16	22.06	-6.06	8.87
66-5	unknown	33.7	14.4	19.3	7.94
61-1	complex	11.49	15.3	-3.81	3.24
45-1	complex	33.86	37.23	-3.37	17.1
37-1	unknown	29.03	20.57	8.46	9.18
37-2	complex	34.78	25.45	9.33	5.24
37-3				0	
37-4				0	
28-1	complex	10.71	15.2	-4.49	3.27
28-2	flat	15.04	20.49	-5.45	4.63
28-3	flat	21.62	18.88	2.74	3.56
28-4	flat	17.32	15.41	1.91	5.74
28-5	complex	16.25	12.87	3.38	2.6
28-6	complex	17.04	27.17	-10.13	4.06
28-7	complex	17.88	19.92	-2.04	2.75
28-8	unknown	22.22	20.4	1.82	6.21
28-9	unknown	19.91	13.89	6.02	3.93

28-10	flat	23.01	23.44	-0.43	6.38
28-11				0	
517-1	complex	11.81	16.55	-4.74	1.72
517-2	flat	44.87	50.86	-5.99	8.07
513-2	complex	32.48	59.45	-26.97	6.01
513-3				0	
513-4	complex	13.16	14.86	-1.7	3.55
525-1	flat	11.88	14.92	-3.04	1.68
525-2	complex	17.62	17.94	-0.32	3.38
525-3	unknown	16.88	17.95	-1.07	3.11
525-4	complex	23.85	22.19	1.66	3.89
629-1	complex	17.4	21.26	-3.86	3.49
629-2				0	
629-3		0.1	0.1	0	0.1
629-4		0.1	0.1	0	0.1
647-1				0	
647-2	flat	16.28	11.61	4.67	4.4
647-3				0	
647-4				0	
647-5		0.1	0.1	0	0.1
419-1				0	
419-2				0	
419-3	flat	20.13	16.25	3.88	5.78
419-4	complex	26.04	19.62	6.42	2.89
419-5	flat	18.64	16.43	2.21	5.02
419-6				0	
419-7	unknown	16.43	20.12	-3.69	3.78
477-1	complex	42.31	42.82	-0.51	8.11
477-2				0	
477-3	unknown	30.55	27.76	2.79	1.43
477-4				0	
477-5				0	
477-6				0	
477-7				0	
477-8	flat	11.81	16.71	-4.9	3.55
477-9	complex	15.58	13.66	1.92	3.35
459-1	flat	11.27	13.12	-1.85	2.69
459-2				0	
459-3				0	
459-4				0	
459-5				0	
441-1	complex	23.21	17.42	5.79	3.45
441-2	flat	31.39	31.88	-0.49	5.46
441-3	complex	29.25	28.48	0.77	8.54
437-5	flat	21.42	21.7	-0.28	4.3
437-31				0	
437-15				0	
437-22				0	

437-11	complex	44.51	35.09	9.42	8.09
437-3	unknown	22.1	21.74	0.36	7.56
437-9				0	
437-28				0	
437-14	complex	29.24	24.84	4.4	4.95
437-23				0	
437-18				0	
437-26	unknown	18.15	15.13	3.02	4.17
437-1				0	
437-21				0	
437-19				0	
437-9				0	
437-12				0	
437-13				0	
437-30				0	
437-8				0	
437-29	flat	27.3	30.45	-3.15	5.14
437-6				0	
437-7				0	
437-17				0	
437-27				0	
437-24				0	
437-10				0	
437-16	flat	23.98	16.23	7.75	4.22
437-2	flat	12.2	21.48	-9.28	5.8
437-20	flat	18.82	24.97	-6.15	5.22
194-2	complex	29.27	36.34	-7.07	6.53
194-3	flat	22.68	43	-20.32	5.84
194-1				0	
194-5				0	
194-4				0	
222-1				0	
222-2				0	
222-3		0.1	0.1	0	0.1
255-2	flat	46.88	32.1	14.78	5.85
255-3	complex	27.48	34.18	-6.7	6.7
255-4	flat	29.13	33.48	-4.35	4.45
287-1	complex	25.28	35.37	-10.09	5.66
737-1	unknown	9.63	9.87	-0.24	2.43
737-2	flat	10.08	13.04	-2.96	3.46
737-3	complex	20.27	24.05	-3.78	4.8
737-4	flat	21.33	13.36	7.97	2.89
731-1	flat	19.62	24.91	-5.29	4.04
731-2	complex	9.11	21.3	-12.19	7.96
731-3				0	
731-4	unknown	10.48	8.31	2.17	2.34
749-1	flat	15.57	22.71	-7.14	4.12
713-2	complex	17.93	27.4	-9.47	4.58

713-5	unknown	10.29	13.33	-3.04	2.17
713-3	flat	37.5	40.6	-3.1	10.2
713-4	complex	29.59	35.27	-5.68	10.15
563-1				0	
563-2	flat	21.4	34.33	-12.93	7.18
563-3				0	
571-1				0	
571-2				0	
571-3				0	
571-4				0	
603-1				0	
581-1	complex	24.09	31.33	-7.24	7.06
581-2	complex	20.18	18.42	1.76	9.18
405-1	complex	55.47	45.16	10.31	5.93
432-1				0	
468-1	flat	25.15	27.94	-2.79	2.62
472-1	complex	14.88	15.59	-0.71	3.6
472-2	flat	12.75	13.67	-0.92	2.27
349-1	complex	14.82	21.95	-7.13	4.02
332-8	complex	10.59	14.91	-4.32	3.67
332-5	unknown	12.14	12.04	0.1	2.32
332-11	complex	21.34	24.02	-2.68	8.26
332-3	complex	13.9	11.1	2.8	4.15
332-4	flat	13.49	12.58	0.91	2.96
332-6	complex	11.14	16.3	-5.16	4.55
332-7				0	
332-9				0	
332-10	complex	13.99	24.08	-10.09	3.7
332-12	unknown	27.94	37.29	-9.35	11.98
332-14	complex	40.85	39.07	1.78	7.23
332-15	complex	29.77	31.4	-1.63	4.47
266-1	complex	7.72	11.85	-4.13	3.04
266-2				0	
266-3	complex	12.44	8.53	3.91	3.77
266-4	complex	7.48	10.32	-2.84	3.16
266-5	complex	12.37	11.71	0.66	1.93
266-6	complex	7.77	13.03	-5.26	2.42
266-7	complex	11.11	9.35	1.76	2.3
266-8	unknown	14.05	9.25	4.8	1.82
266-9	flat	10.93	9.18	1.75	2.41
266-10				0	
266-11	complex	13.35	13.21	0.14	3.1
266-12				0	
266-13	complex	12.44	13.6	-1.16	1.71
266-14	complex	15.6	13.84	1.76	3.66
266-15	complex	18	14.73	3.27	3.37
266-16	complex	15.54	18.38	-2.84	3.22
266-17				0	

266-18	flat	24.28	14.18	10.1	7.4
266-19	complex	11.56	17.68	-6.12	2.44
266-20	complex	12.4	17.07	-4.67	2.96
266-21	unknown	10.25	17.05	-6.8	1.47
266-22				0	
266-23	unknown	27.16	25.41	1.75	4.97
266-24	complex	14.79	30.92	-16.13	3.9
266-25				0	
266-26	flat	34.64	26.54	8.1	5.72
266-27	unknown	26.16	31.54	-5.38	3.67
266-28	flat	35.27	33.81	1.46	5
266-29	complex	44.37	42.38	1.99	5.61
163-5	complex	37.76	28.64	9.12	3.04
163-6	complex	22.96	15.34	7.62	5.05
163-7	unknown	10.67	10.53	0.14	1.33
163-8	unknown	13.61	15.57	-1.96	2.8
163-9				0	
168-10	complex	35.89	20.79	15.1	7.17
163-11	complex	11.78	10.98	0.8	3.4
163-13	unknown	13.01	10.88	2.13	2.18
163-14				0	
163-15	complex	13.74	23.93	-10.19	3.82
163-16	flat	18.31	28.06	-9.75	5.24
163-17	complex	21.47	21.55	-0.08	7.89
163-18				0	
163-19				0	
161-1	complex	30.49	21	9.49	10.3
161-2					
161-3					
280-1	complex	29.51	34.11	-4.6	8.05
1027-6	complex	26.22	29.16	-2.94	7.5
1027-5	complex	39.53	38.8	0.73	11.25
1027-3	complex	36.59	72.39	-35.8	8.79
1027-2	complex	54.21	55.73	-1.52	15.63
1027-1	smooth	73.14	94.27	-21.13	23.81
1191-1	complex	28.66	51.01	-22.35	8.27
1085-2	complex	32.91	48.45	-15.54	8.45
82-1	complex	79.32	46.02	33.3	10.23
1140-6	polished	40.37	29.64	10.73	9.39
1140-7	flat	44.81	34.59	10.22	12.48
977-1	complex	28.54	33.73	-5.19	9.47
75-1	complex	22.11	26.07	-3.96	10.05
1207-1	complex	18.71	31.89	-13.18	7
1173-1	flat	28.44	38.7	-10.26	9.14
720-1	flat	35.69	19.82	15.87	9.16
964-1	complex	19.98	28.64	-8.66	9.84
1061-1	flat	34.43	14.72	19.71	7.02
1061-2	complex	60.78	41.02	19.76	9.68

1061-3	flat	35.33	34.22	1.11	7.31
343-1	flat	29.27	33.26	-3.99	9.71
322-1	complex	26.84	26.26	0.58	9.79
322-2	flat	23.39	29.37	-5.98	10.6
322-6	flat	28.68	51.72	-23.04	14.54
1044-7	unknown	25.43	20.11	5.32	10.02
964-2	flat	59.8	48.55	11.25	7.05
720-2	flat	35	34.48	0.52	6.42
82-2	complex	18.57	32.04	-13.47	9.1
508-1	complex	32.11	33.21	-1.1	9.91
127-14	flat	31.21	42.44	-11.23	10.19
127-8	complex	29.36	26.45	2.91	10.58
255-1	complex	39.8	64.66	-24.86	13.91
761-1	complex	19.75	48.98	-29.23	21.95
248-1	complex	26.36	51.5	-25.14	9.55
163-3	wedging	48.45	27.23	21.22	13.09
796-1	cortical	67.04	45.05	21.99	20.36
456-4	flat	59.7	82.96	-23.26	17.27
456-3	flat	46.43	66.57	-20.14	9.51
456-8	cortical	58.92	54.2	4.72	17.29
456-7	flat	80.22	52.28	27.94	20.56
1151-1	complex	45.67	45.01	0.66	16.37
456-6	complex	33.06	102.86	-69.8	23.12
1153-2	flat	72.39	62.11	10.28	11
456-13	flat	58.91	42.62	16.29	17.04
456-5	flat	47.29	56.2	-8.91	12.81
140-1	polished	68.66	43.86	24.8	15.37
279-1	flat	45.64	61.69	-16.05	17.45
140-2	cortical	33.57	58.18	-24.61	14.21
112-4	complex	23.11	38.62	-15.51	9.44
243-1	complex	36.27	40.95	-4.68	11.86
560-1	flat	29.03	31.29	-2.26	9.09
737-1	polished	31.18	19.14	12.04	6.99
437-25	complex	52.04	30.91	21.13	21.78
656-1	flat	35.21	23.81	11.4	11.33
781-2	flat	25.01	27.11	-2.1	7.92
1132-1	complex	42.24	28.41	13.83	7.8
629-1	flat	10.8	23.43	-12.63	39.61
470-1	complex	36.21	48.73	-12.52	10.44
332-13	complex	44.03	24.84	19.19	8.81
615-1	flat	58.76	46.91	11.85	12.86
670-1	polished	11.75	26.6	-14.85	13.01
713-5	flat	31.6	20.34	11.26	9.39
575-1	flat	31.93	28.2	3.73	8.42
794-2	complex	36.08	30.85	5.23	9.53
1155-1	complex	53.38	41.23	12.15	8.74
676-1	complex	35.43	48.64	-13.21	11.92
1153-1	complex	55.27	28.46	26.81	16.62

794-1	complex	38.13	22.4	15.73	7.52
666-1	polished	42.26	40.03	2.23	14.55
456-12	flat	36.65	44.19	-7.54	22.17
456-11	complex	41	34.39	6.61	22.8
456-16	flat	30.86	47.47	-16.61	11.08
456-14	flat	55.82	48.27	7.55	11.27
456-9	flat	29.6	30.8	-1.2	12.14
456-10	complex	12.21	37.69	-25.48	34.5
456-15	complex	34.2	39.79	-5.59	11.49
713-1	flat	33.01	32.87	0.14	9.8

Artifact #	Dorsal scars	Weight	stage
113-1	1	9.22	1
1056-7	3	22.36	1
1056-1	0	9.74	1
1056-14	2	1.48	1
1056-9	3	1.62	1
1056-12	4	1.06	1
1056-6	2	2.96	1
1056-8	2	0.48	1
1056-10	1	0.86	1
1056-3	3	1.96	1
1056-2	2	0.46	1
1056-4	4	1.26	1
1056-5	1	0.56	1
1056-11	10	1.28	1
1056-13	3	0.62	1
1056-15	2	0.34	1
1056-16	4	0.36	1
1056-17	1	0.56	1
1056-18			1
1056-19			1
1056-20			1
1056-21			1
1056-22			1
1056-23			1
1056-24			1
1056-25			1
1056-26			1
1056-27			1
1056-28			1
1056-29			1
1056-30			1
1056-31			1
1056-32			1

1056-33			1
1056-34			1
1056-35			1
1056-36			1
1056-37			1
1056-38			1
1056-39			1
1056-40			1
1056-41			1
1056-42			1
1056-43			1
1056-44			1
1056-45			1
422-1	2	0.18	1
191-1	10	0.96	1
191-4	1	6.52	1
191-5		1.62	1
191-6	2	1.56	1
191-7	3	2.66	1
191-8	3	0.34	1
191-9	5	7.74	1
191-12	2	21.26	1
260-1	2	0.46	1
209-1	4	4.44	1
209-2	3	0.8	1
209-3	0	0.76	1
209-4	3	2.14	1
209-5	4	2.14	1
209-6		0.8	1
209-7	0	1.16	1
209-8		2.36	1
209-9	3	4.8	1
209-10	2	1.14	1
209-11			1
209-12			1
209-13			1
209-14			1
237-1	2	1.84	1
237-2	1	27.82	1
237-3	1	1.26	1
237-4		0.26	1
237-5	2	0.38	1
237-6	10	3.62	1
237-7	10	0.74	1
237-8	3	0.36	1
237-9	3	3.08	1
237-10	2	0.94	1
237-11	2	3.32	1

237-12	3	0.86	1
237-13	0	0.5	1
237-14	2	3.48	1
959-2	10	16.54	1
959-3	2	2.04	1
959-4	0	10.74	1
959-5	10	6.88	1
959-6	4	29.36	2
959-8	1	1.56	1
959-10			1
216-1	6	8.1	1
216-2	4	1.7	1
21-1	7	22.4	3
21-2	4	5.38	1
21-3	7	1.94	1
21-4	2	1.42	1
21-5	3	4.88	1
21-6	3	1.24	1
21-7	2	1.3	1
21-8	11	4.46	1
21-9	2	2.04	1
21-10	4	0.9	1
21-11	1	1.68	1
21-12	0	1.4	1
21-13	3	11.62	1
21-14	3	3.8	1
21-15	3	0.82	1
21-16	3	0.72	1
21-17	4	3.66	1
21-18	0	1.98	1
21-19	2	3.12	1
21-20	4	2.44	1
21-21	3	0.54	1
21-22	0	5.4	1
21-23	3	16.24	1
21-24	2	0.6	1
21-25	1	2.34	1
21-26	3	2.6	1
21-27	3	1.46	1
21-28	2	0.56	1
21-29	2	0.32	1
21-30	0	0.56	2
21-31	3	1.1	1
21-32	3	1.76	1
21-33	1	2.66	1
21-34	2	0.56	1
21-35	2	0.14	1
21-36	3	0.24	1

1037-2	1	1.1	1
1037-3	4	1.18	1
1037-4	3	1.08	1
1037-5		0.24	1
1037-6		0.14	1
1037-7		0.2	1
487-1	1	3.04	1
487-2	1	4.12	2
487-3	1	3.34	1
487-4		8.02	1
487-6	10	3.64	1
487-7		1.26	1
487-8		1.06	1
487-9		0.98	1
487-10		0.32	1
17-1		10.56	1
144-1		2.96	1
280-1		6.82	1
1027-10	2	1.76	1
1027-13	2	0.26	1
1027-18	4	1.14	1
1027-20	1	0.28	1
1027-22	4	3.4	1
1027-25	2	1.42	1
1027-7	3	0.28	1
1027-28	2	0.78	1
1027-17	3	0.78	1
1027-16	3	1.12	1
1027-45	3	1.84	1
1027-32	2	1.12	1
1027-34	2	0.32	1
1027-35	3	0.28	1
1027-21	2	0.68	1
1027-36	1	0.46	1
1027-39	3	0.36	1
1027-8	3	2.62	1
1027-12	3	1.34	1
1027-29		0.52	1
1027-44	2	0.24	1
1027-9	3	0.66	1
1027-26	1	0.98	1
1027-4	4	6.88	1
1027-42	3	1.58	1
1027-43	3	0.82	1
1027-24	3	0.32	1
1027-41	2	0.32	1
1027-38	1	1.02	1
1027-14	2	2.08	1

1027-9	2	1.04	1
1027-19	3	0.52	1
1027-40	1	0.2	1
1027-31	2	1.28	1
1027-37	2	0.82	1
1027-11	3	0.8	1
1027-27	2	0.48	1
1027-30	2	0.92	1
1027-18	1	0.78	1
1027-33	3	0.5	1
1027-15	1	0.6	1
1027-23	3	0.96	1
776-1	2	0.44	1
886-1	2	0.72	1
930-1	2	0.3	1
1211-1	2	4.4	1
1211-2	2	0.42	1
670-2	3	46.88	2
670-3	2	0.78	1
720-1	3	1.1	1
720-2	0	1.94	2
720-3	1	0.24	1
720-4	2	0.54	1
938-1	4	19.54	1
938-2	2	4.04	1
938-3	2	0.3	1
938-4	3	1.02	1
938-5	4	2.76	1
938-6	3	1.64	1
938-7	3	8.58	2
938-8	2	2.44	2
938-9	2	2.18	1
938-10	0	2.9	1
938-11	3	7.04	1
938-12			1
938-13			1
938-14			1
938-15			1
1177-1	5	1.78	1
1177-2	5	1.42	1
1049-1	1		1
1049-2			1
1168-1	2	2.38	1
977-1	2	0.22	1
977-2	0	0.2	1
977-3	1	0.6	1
977-4	1	0.78	1
977-5	3	1.82	1

706-1	2	2.82	1
706-2			1
706-3			1
706-4			1
770-1	3	0.4	1
912-1	2	0.2	1
1054-1	0	0.2	1
1054-2	1	0.14	1
1054-3	3	0.46	1
1054-4	2	1.24	1
964-1	2	2.28	1
964-2	2	3	1
946-3	1	1.42	1
964-4	2	3.14	2
807-1	3	2.08	2
807-2	2	0.28	1
807-3	3	3.14	1
807-4	2	9.48	1
807-5			1
1044-1	1	0.14	1
1044-2	4	0.3	1
1044-3	2	0.18	1
1044-4	1	1.32	1
1044-5	2	0.76	1
1044-6	3	0.84	1
1188-1	2	0.58	1
1188-2	2	0.32	1
1188-3	2	0.3	1
1188-4	1	0.66	1
1085-1	3	2.84	1
1122-1	3	0.3	1
1122-2	2	0.6	2
1122-3	2	1.04	1
1061-1	1	0.12	1
1061-2	2	0.2	1
1061-3	1	0.34	1
1061-4	2	0.72	1
1061-5	1	0.5	1
1061-6	2	0.8	1
1061-7	4	1.2	1
1061-8	2	2.74	1
1061-9	4	4.66	1
1061-10	1	2.64	1
1061-11	2	3.78	1
1061-12	1	2.4	1
1061-13			1
1173-1	2	2.42	2
1173-2	2	3.54	1

1137-1	1	0.9	1
794-1	3	2	1
794-2	2	1.1	1
794-3	3	2.5	1
1010-1	4	1.18	1
1010-2	3	0.92	2
1079-1	2	1.64	1
1165-1	4	2.36	1
1165-2	2	4.8	1
796-2	1	2.32	2
1069-1	4	28.64	1
1069-2	2	1.92	1
1069-3	4	1.94	1
1069-4			1
1069-5			1
1140-1	2	0.32	1
1140-2	2	5.12	1
1140-3	2	2.84	1
1140-5	2	0.98	1
1140-4	2	1.42	1
1140-6			1
785-1	2	0.36	1
785-2	3	2.24	1
785-4	4	9.76	1
664-1	3	2.6	1
656-1	3	16.66	1
656-2	3	0.34	1
656-3	2	0.58	1
656-4	0	0.6	1
656-5	1	1.66	1
656-6	2	2.64	1
735-1	1	3.86	1
735-2	2	5.6	1
735-3	1	3.12	2
735-4	1	9.64	1
753-1	3	3.44	1
753-2	3	1.32	1
753-3	2	2.96	1
753-4	3	1.86	1
753-5	3	11.9	1
872-1	1	0.78	2
848-1	1	1.58	1
707-1	2	1.24	1
707-2	1	0.72	2
707-3	2	3.08	1
707-4	2	1.84	2
707-5	1	3.72	1
698-1			1

744-1	2	2.64	1
729-1	3	1.26	1
761-1	2	7.58	1
783-1	6	3.02	1
783-2	2	6.08	1
1240-1	2	1.96	1
1240-2	3	2.22	1
1240-3	4	1.08	1
1240-4	1	1.38	1
1185-1	2	1.02	1
800-1	4	15.36	1
800-2	2	0.84	1
800-3	2	1.68	1
975-1	5	2.36	1
821-1	0	0.52	1
843-1	2	41.78	1
843-2	3	4.72	1
890-1	4	3.56	1
869-1			
1113-1	3	4.74	1
1132-2	2	5.02	1
115-1			
95-1	4	6.26	1
23-1			
23-3			
23-4	1	20.42	3
23-6	3	4.56	1
23-7	4	16.5	1
806-1	3	1.42	1
692-1	6	16.32	1
760-1	3	1.7	1
760-3	3	0.66	1
720-4			1
781-3	3	3.1	1
781-4			
781-5	2	4.16	1
78-1			
78-2			
78-3			
53-2			
53-3			
40-2	1	21.56	2
40-3	1	11.66	1
40-4	4	15.36	1
40-5	2	2.34	1
40-6	2	2.04	1
32-2	1	1.12	1
32-3			

32-4			
32-5	3	3.64	1
18-3			
18-4			
18-5			
18-6			
18-7			
18-8			
18-9			
18-10			
18-11			
322-3	2	0.58	1
322-4	3	2.78	1
322-5	2	1.06	1
322-6	2	2.96	1
322-7	3	0.56	1
322-8	2	1.5	1
322-9	4	1.1	1
322-11	2	0.78	1
322-12			1
322-13	1	0.24	1
314-1	1	2.28	1
314-2	3	4.32	1
314-3	3	5.8	1
248-2	1	0.6	1
274-1	3	0.96	1
140-3	2	1.24	1
140-4			
140-5	3	3.26	1
140-6	3	2.44	1
140-8	2	1.52	1
140-9	3	2.92	1
132-3	2	0.54	1
132-2	2	0.42	1
132-4	3	1.98	1
132-5	2	0.66	1
132-6	2	0.62	1
132-7	3	2.75	1
132-8	2	1.12	1
132-9	1	1.24	2
132-10	3	2.62	1
132-11	2	0.78	1
132-12	3	0.92	1
132-13	2	1.92	1
132-14	5	1.82	1
132-15	2	2.5	1
132-16	2	2.22	1
132-17	3	2.48	1

112-1	2	2.72	1
112-2	3	1.82	1
112-3	3	1	1
112-5	2	3.38	1
112-6	3	6.12	1
160-1 f	1	9.1	1
283-1	1	0.82	1
283-2	3	1.38	1
283-3	3	0.4	1
283-4	1	0.28	1
366-1	2	0.7	1
366-2	1	2.28	1
366-3	0	0.66	1
366-4	1	2.1	2
366-5	1	4.48	1
110-1	3	0.18	1
110-2	2	0.88	1
110-3	3	0.34	1
110-4	4	0.9	1
110-5	4	1.82	1
82-1	2	0.22	1
82-2	2	0.44	1
82-3	2	1.86	1
82-4	3	1.16	1
82-5			
75-1	3	1.12	1
75-2	2	1.36	1
75-3	3	4.94	1
75-4	1	2.66	1
75-5			
75-6			
68-1	2	0.16	1
66-1	3	0.24	1
66-2	2	0.72	1
66-3	3	0.4	1
66-4	1	1.92	1
66-5	4	5.74	1
61-1	1	0.36	1
45-1	4	21.4	2
37-1	1	4.26	1
37-2	1	5.4	1
37-3			
37-4			
28-1	1	0.58	1
28-2	1	1.68	1
28-3	1	1.84	1
28-4	1	1.44	1
28-5	2	0.66	1

28-6	1	2.26	1
28-7	2	1.38	1
28-8	1	3.42	1
28-9	1	1.36	1
28-10	2	3.92	1
28-11			
517-1	1	0.3	1
517-2	2	16	1
513-2	2	10.82	2
513-3			
513-4	2	0.7	1
525-1	1	0.3	1
525-2	0	1.1	3
525-3	1	0.88	2
525-4	3	2.72	1
629-1	2	1.32	1
629-2			
629-3			
629-4			
647-1			
647-2	2	0.72	1
647-3			
647-4			
647-5			
419-1			
419-2			
419-3	2	1.54	1
419-4	1	1.76	2
419-5	3	1.6	1
419-6			
419-7	2	1.18	1
477-1	2	21.1	1
477-2			
477-3	3	11.6	1
477-4			
477-5			
477-6			
477-7			
477-8	2	0.78	1
477-9	2	0.52	1
459-1	2	0.3	1
459-2			
459-3			
459-4			
459-5			
441-1	3	0.84	1
441-2	2	5.56	1
441-3	3	7.56	1

437-5	3	2.28	1
437-31			
437-15			
437-22			
437-11	1	14.12	2
437-3	3	3.2	1
437-9			
437-28			
437-14	3	3.2	1
437-23			
437-18			
437-26	1	1.26	1
437-1			
437-21			
437-19			
437-9			
437-12			
437-13			
437-30			
437-8			
437-29	2	4.5	1
437-6			
437-7			
437-17			
437-27			
437-24			
437-10			
437-16	1	1.84	1
437-2	2	1.56	1
437-20	4	2.98	1
194-2	2	6.54	1
194-3	2	5.34	1
194-1			
194-5			
194-4			
222-1			
222-2			
222-3			
255-2	7	8.46	1
255-3	3	5.88	1
255-4	2	4.32	1
287-1	3	5.48	1
737-1	1	0.22	1
737-2	3	0.38	1
737-3	3	2.3	1
737-4	1	0.58	1
731-1	1	1.92	1
731-2	2	1.82	1

731-3			
731-4	2	0.22	1
749-1	1	1.52	1
713-2	3	2.8	1
713-5	2	0.34	1
713-3	3	12.24	2
713-4	2	11.02	1
563-1			
563-2	1	4.42	1
563-3			
571-1			
571-2			
571-3			
571-4			
603-1			
581-1	2	5.44	1
581-2	1	2.2	1
405-1	5	18.02	1
432-1			
468-1	0	1.9	3
472-1	2	0.56	1
472-2	3	0.56	1
349-1	2	1.14	1
332-8	2	0.66	1
332-5	1	0.42	1
332-11	3	2.66	1
332-3	2	0.62	1
332-4	3	0.46	1
332-6	3	0.8	1
332-7			
332-9			
332-10	2	1.58	1
332-12	3	7.72	2
332-14	5	8.96	1
332-15	3	4	1
266-1	2	0.32	1
266-2			
266-3	2	0.38	1
266-4	2	0.18	1
266-5	2	0.24	1
266-6	2	0.2	1
266-7	2	0.26	1
266-8	1	0.3	1
266-9	2	0.2	1
266-10			
266-11	3	0.42	1
266-12			
266-13	1	0.42	1

266-14		2	0.74	1
266-15		2	0.8	1
266-16		2	0.8	1
266-17				
266-18		4	1.62	1
266-19		3	0.58	1
266-20		2	0.56	1
266-21		1	0.28	1
266-22				
266-23		0	3.26	3
266-24		2	1.98	1
266-25				
266-26		4	5.24	1
266-27		2	3.32	1
266-28		3	8.18	1
266-29		5	11.22	1
163-5		4	5.46	1
163-6		3	1.94	1
163-7		1	0.22	1
163-8		3	0.6	1
163-9				
168-10		4	4.96	1
163-11		1	0.38	1
163-13		1	0.46	1
163-14				
163-15		2	1.36	1
163-16		1	2.9	1
163-17		3	3.04	1
163-18				
163-19				
161-1		3	6.54	1
161-2				
161-3				
280-1	4+		6.82	1
1027-6		3	4.48	1
1027-5		2	11.14	2
1027-3	4+		27.08	1
1027-2	4+		47.3	1
1027-1		2	107	1
1191-1	4+		14.9	1
1085-2		2	12.04	1
82-1		3	23.16	1
1140-6	4+		11.96	1
1140-7		3	11.08	1
977-1		4	7.14	1
75-1		6	6.8	1
1207-1		4	4.28	1
1173-1		3	10.28	1

720-1	4	7.82	1
964-1	5	6.06	1
1061-1	3	4.32	1
1061-2	4	18.42	1
1061-3	2	9.62	2
343-1	5	9.36	1
322-1	5	7.44	1
322-2	6	5.64	1
322-6	8	24.08	1
1044-7	3	4.46	1
964-2	3	23.56	1
720-2	6	7.62	1
82-2	6	4.8	1
508-1	2	11.4	1
127-14	2	11.4	1
127-8	3	9.04	1
255-1	7	33.54	1
761-1	6	17.14	1
248-1	4	11.1	1
163-3	5	27.2	1
796-1	10	68.18	1
456-4	5	66.48	1
456-3	2	30.36	2
456-8	0	45.66	3
456-7	6	93.44	1
1151-1	4	34.58	1
456-6	6	75.38	1
1153-2	4	59.8	1
456-13	3	46.88	2
456-5	4	37.76	1
140-1	5	39.44	1
279-1	3	56.42	2
140-2	3	31.62	1
112-4	4	9.76	1
243-1	2	17.52	1
560-1	6	8.8	1
737-1	4	5.18	1
437-25	0	34.66	1
656-1	3	11.08	2
781-2	3	4.4	1
1132-1	5	9.46	1
629-1	0	12.58	1
470-1	5	10.08	1
332-13	6	11.78	1
615-1	5	29.34	1
670-1	3	5.54	1
713-5	4	6.44	1
575-1	5	7.1	1

794-2	3	12.2	1
1155-1	5	17.5	1
676-1	3	18.16	1
1153-1	7	20.06	1
794-1	4	8.68	1
666-1	2	19.98	1
456-12	6	19.44	1
456-11	4	28.46	2
456-16	3	15.86	1
456-14	2	29.38	3
456-9	1	11.38	2
456-10	6	16.8	1
456-15	2	13.9	1
713-1	3	13.24	1

APPENDIX D

SAMPLES FOR INAA

1027-6	Flake	10yr 7/1
1027-5	Flake	10yr 6/1
1027-3	Flake	10yr 7/1
1027-2	Flake	10yr 7/1
1027-1	Flake	10yr 6/1
1191-1	Flake	2.5yr 5/0
280-1	Flake	2.5y 6/0
1085-2	Flake	2.5yr 5/0
1127-1	flake tool I fragment	2.5yr 6/0
1194-1	unknown	10yr 6/0
82-1	Flake	2.5yr 4/0
1140-6	rejuvination flake	5y 4/1
1140-7	Flake	5y 5/1
977-1	Flake	7.5yr 5/0
75-1	Flake	7.5yr 4/0
1207-1	Flake	7.5yr 5/0
1173-1	rejuvination flake	2.5yr 5/0
720-1	Flake	2.5yr 5/0
964-1	Flake	2.5yr 6/0
1061-1	Flake	5y 4/1
1061-2	Flake	5y 5/1
1061-3	Flake	7.5yr 4/0
343-1	Flake	2.5yr 4/0
322-1	Flake	2.5yr 4/0
322-2	Flake	2.5yr 4/0
322-6	Flake	2.5yr 4/0
1044-7	Flake	2.5yr 5/0
964-2	Flake	5y 5/1
720-2	Flake	2.5y 5/0
82-2	Flake	2.5y 4/0
508-1	Flake	2.5yr 4/0
127-14	Flake	2.5yr 4/0
127-8	rejuvination flake	2.5yr 4/0
432-2	Ib fragment	7.5y 5/1
23-5	Fragment VII/ Distal end missing	7.5yr 5/0
127-6	Core/ Multidirectional	2.5yr 4/0
255-1	Flake	7.5yr 5/0
959-2	Flake	10yr 4/1
959-4	Flake	7.5yr 4/0
191-12	Flake	2.5yr 4/0

127-13	adze fragment, both ends missing	2.5yr 5/0
256-3	unknown	2.5yr 5/0
761-1	Flake	2.5yr 5/0
560-1	Flake	2.5yr 5/0
243-1	Flake	2.5yr 4/0
737-1	rejuvination flake	2.5y 5/0
656-1	Flake	2.5y 4/0
781-2	Flake	2.5y 5/0
1132-1	Flake	2.5y 5/0
629-1	Flake	5y 5/1
470-1	Flake	2.5y 4/0
332-13	flake	2.5y 5/0
140-1	rejuvination flake	7.5yr 5/0
140-2	Flake	2.5yr 4/0
248-1	Flake	7.5yr 5/0
112-4	Flake	7.5yr 4/0
279-1	Flake	7.5yr 5/0
437-25	angular shatter	5y 6/1
615-1	Flake	2.5y 6/0
670-1	rejuvination flake	2.5y 5/0
713-5	rejuvination flake	2.5y 4/0
575-1	Flake	7.5yr 5/0
163-3	angular shatter	5y 5/1
796-1	core	5y 2.5/1
794-2	rejuvination flake	2.5y 5/0
794-1	rejuvination flake	2.5y 5/0
676-1	Flake	2.5y 4/0
1154-2	Reworked adze/Distal end missing	10y 5/1
1153-1	Flake	2.5y 4/0
666-1	rejuvination flake	2.5y 4/2
1155-1	rejuvination flake	5y 4/1
870-1	Medial Adze Fragment (VI, VIII)	7.5y 5/1
1151-1	Flake	5y 4/1
456-7	Flake	5y 4/1
456-8	core	5y 4/1
456-3	Flake	5y 5/1
456-4	Flake	5y 5/1
456-5	Flake	5y 5/1
456-6	Flake	5y 5/1
456-9	Flake	5y 4/1
456-10	Flake	5y 4/1
456-11	Flake	5y 4/1
456-12	Flake	5y 5/1
456-13	Flake	5y 5/1
456-14	Flake	5y 4/1

456-15	Flake	5y 4/1
456-16	Flake	5y 5/1
1153-2	Flake	2.5yr 4/0
1154-1	Adze VI	5y 5/1
713-1	Flake	7.5yr 5/0

APPENDIX E

INAA RESULTS

	AL	DY	MG	MN	TI	V	LA	LU
	1779	94.5	1014.6	1810.8	320.1	1434.3	1596.2	208.4
CC-001	94162.13	11.88617	6763.689	1293.922	14041.02	113.0961	60.47237	0.373076
CC-002	93115.98	12.03616	6082.5	1322.075	15119.63	90.58098	63.01117	0.403495
CC-003	94919.97	11.74248	6576.578	1294.228	14733.43	93.5246	61.14128	0.400344
CC-004	95538.54	12.45176	8074.198	1301.485	13861.32	110.7254	61.73261	0.389221
CC-005	98656.01	12.3947	6233.021	1297.488	15610.1	109.685	60.73954	0.407294
CC-006	91636.77	10.50804	7167.455	1312.629	18492.52	176.4976	47.32018	0.3634
CC-007	95454.2	12.7408	6474.155	1339.638	15699.76	97.43372	61.10036	0.393827
CC-008	114620.3	12.9733	7113.469	1354.255	15288.68	116.0998	61.44144	0.399899
CC-009	96412.42	14.31102	7331.857	1381.321	14258.56	105.3197	61.87381	0.415621
CC-010	97242.91	7.040088	8131.714	1313.236	21225.39	230.4295	39.23761	0.356803
CC-011	78583.97	6.551565	11665.4	1408.776	27867.75	274.9398	46.86883	0.313545
CC-012	63036.61	5.881802	16951.43	1300.378	25933.12	332.4793	29.35711	0.237626
CC-013	94022.34	8.988659	7734.89	1419.965	24659.57	264.3199	36.40572	0.418875
CC-014	81964.88	9.365274	7350.812	1295.074	21245.91	235.5987	40.59811	0.381698
CC-015	98507.47	14.36754	8493.246	1415.217	16687.72	104.3293	61.81679	0.425315
CC-016	97738.84	13.57554	7976.209	1407.571	15271.92	108.5925	63.17026	0.467098
CC-017	79498.02	7.594679	14579.17	1401.547	29360.22	376.8701	35.1899	0.227683
CC-018	121705.6	8.614722	8340.275	1269.351	25060.77	255.0057	38.71217	0.305994
CC-019	98109.7	9.252341	9702.934	1338.83	24803.41	281.0841	37.91571	0.362731
CC-020	91542.81	7.186807	12373.33	1238.041	26442.88	288.7391	43.85388	0.275603
CC-021	99554.69	8.816077	7577.918	1294.366	22714.19	273.453	36.87481	0.379642
CC-022	96284.2	7.938887	11460.85	1239.301	27188.97	302.4282	33.925	0.317725
CC-023	93774.63	12.5977	5932.472	1248.971	13591.53	98.34507	64.27497	0.452535
CC-024	95783.32	14.11755	6173.641	1340.269	13384.86	113.4602	63.2266	0.461546
CC-034	92594.86	14.25856	6112.422	1218.898	15925.32	118.6917	62.31432	0.426864
CC-035	76413.58	7.818037	13842.06	1293.372	29464.36	359.3578	35.82259	0.262746
CC-036	67813.46	7.55381	14479.51	1348.517	29274.1	357.4935	33.51366	0.235387
CC-037	76705.2	6.854299	14505.65	1328.361	28225.44	359.0668	34.42369	0.25556
CC-038	66264.77	6.958017	13609.73	1304.668	26240.2	346.5551	33.47224	0.245756
CC-039	76386.45	6.766154	11285	1296.726	26918.29	317.5717	41.47763	0.286375
CC-040	92903.5	7.991056	11922.18	1401.276	27989.67	308.0613	46.10394	0.287708
CC-041	71205.36	7.804113	11947.54	1438.844	29246.02	257.457	45.69296	0.312251
CC-042	82743.56	6.534473	8431.059	1236.706	32267.65	343.0286	24.02336	0.269177
CC-043	63051.77	7.276427	13031.44	1244.337	27817.3	318.9069	29.14031	0.260655
CC-044	112767.5	12.46645	5903.727	1440.864	16698.17	101.6735	54.16065	0.466494
CC-045	89554.21	8.654467	8407.911	1306.945	23219.57	273.8648	37.66067	0.366402
CC-046	92941.41	9.692614	7732.513	1267.74	23262.17	258.3247	37.68911	0.312203
CC-047	86494.45	9.5231	8068.749	1322.415	24233.62	265.5896	37.00072	0.347196

CC-048	79105.27	7.408511	9437.704	1252.099	29189.46	318.6772	26.34431	0.280487
CC-049	85084.4	7.249632	9303.167	1248.15	30716.76	317.8996	26.2771	0.270996
CC-050	82690.91	8.633767	7389.197	1324.604	24094.71	286.1649	37.7725	0.357453
CC-051	85269.3	6.784151	11929.88	1512.247	29344.17	360.0425	36.12703	0.305666
CC-052	93456.66	8.702219	7680.918	1362.016	23275.21	275.8853	37.76158	0.355641
CC-053	89337.27	7.599265	7326.431	1325.877	25479.65	283.1394	38.55213	0.374004
CC-054	110161	11.87607	5968.954	1345.549	16766.57	106.8527	60.95519	0.5601
CC-055	100204.3	8.754313	7400.593	1406.101	20987.14	220.2496	44.10688	0.360685
CC-056	90642.09	7.986177	7197.628	1440.146	22638.83	244.4257	39.76798	0.334564
CC-057	88859.24	9.669776	7140.805	1444.528	23861.13	244.4384	41.38143	0.363162
CC-067	91910.49	8.888026	7834.951	1361.642	24309.57	298.4302	37.68882	0.345045
CC-068	80524.42	6.775962	13543.41	1493.441	31005.51	370.9946	34.35573	0.207126
CC-069	78825.18	8.454265	13873.5	1387.693	28336.25	358.1	40.21262	0.301007
CC-070	91077.98	9.513177	7210.406	1456.432	21174.06	227.8633	42.13548	0.357747
CC-071	85588.66	7.537884	13231.88	1510.08	30451.55	354.7615	32.81433	0.280642
CC-072	110036.7	7.778465	7645.026	1403.081	22228.74	249.4312	41.14442	0.36171
CC-073	97529.69	8.685019	8006.889	1399.945	22611.47	224.9366	42.04849	0.354873
CC-074	97622.52	7.981496	9484.336	1333.716	27341.7	271.3336	34.55766	0.335666
CC-075	93380.98	6.591236	6685.366	1303.475	26453.37	267.5994	37.26246	0.336133
CC-076	93151.62	8.653564	9128.224	1442.506	26094.62	296.2315	36.47561	0.366766
CC-077	100901.2	9.918519	7050.078	1216.224	26007.84	299.39	37.42535	0.432182
CC-078	95913.66	9.859269	7779.998	1543.357	24144.07	247.6857	41.07963	0.376296
CC-079	88092.6	11.2535	8357.809	1390.656	27791.59	297.2031		
CC-080	100520.3	10.18501	7546.915	1227.223	22609.34	272.2973		
CC-081	85189.63	9.895326	9567.301	1239.576	34244.77	366.5775	27.26365	0.343583
CC-082	97441.27	7.945554	7466.481	1222.6	22929.1	245.7009		
CC-083	77956.06	8.533635	12307.36	1391.422	27213.27	319.5419	34.5506	0.248164
CC-084	93595.2	11.83344	6165.722	1300.837	16276.98	156.4144	48.61503	0.381592
CC-085	102314.2	8.421823	7825.455	1163.678	22315.28	261.0498	38.13013	0.324752
CC-086	91919.47	11.74798	7032.416	1216.417	21155.88	273.2928	37.98981	0.358914
CC-087	94753.59	9.813949	7801.739	1226.969	21617.96	276.93	36.58045	0.366419
CC-097	88359.03	8.216656	7655.807	1220.277	23547.21	296.2834	36.72737	0.357545
CC-098	92843.49	10.82706	7461.729	1278.428	23702.4	290.1488	36.86104	0.367875
CC-099	94125.02	12.06084	7418.926	1329.573	16249.71	152.9892	48.81567	0.375127
CC-101	92846.95	7.768951	7653.466	1183.664	23390.08	288.4783	35.93747	0.323062
CC-102	124003.2	11.60587	7463.433	1378.724	24009.74	262.5792	38.86211	0.339509
CC-103	118427.3	8.38795	8605.489	1154.05	30428	305.0038	26.89063	0.255959
CC-104	91641.28	10.60485	8388.533	1302.959	24731.53	267.6312	37.40235	0.359529
CC-105	90745.59	9.044582	7465.756	1371.831	21775.11	229.5148	40.31121	0.354769
CC-106	91142.23	10.29555	7769.234	1287.908	26828.8	282.135	36.59745	0.353631
CC-107	87824.91	6.462412	8905.971	1189.051	32322.78	317.9731	27.50513	0.291635
CC-108	82835.15	7.857158	9886.761	1211.411	28902.91	325.834	27.34758	0.281683
CC-109	95262	11.56012	8619.182	1347.286	25834.57	281.2929	39.57632	0.390664
CC-110	74855.14	5.78773	8832.474	1112.688	25491.5	299.44	29.51158	0.310259
CC-111	91290.43	9.202871	7259.124	1281.935	24522.35	278.8073	40.41551	0.418784

CC-112	94400.51	8.232175	12063.07	1446.416	28579.34	342.8582	36.05717	0.305079
CC-113	84038.52	8.118413	12006.03	1437.688	26746.02	312.0602	36.19421	0.305712
CC-114	90485.96	10.19544	13058.84	1475.483	30849.64	321.7564	35.9801	0.31081
CC-115	89356.55	7.394539	12415.44	1499.891	27700.01	320.2482	34.50289	0.312957
CC-116	83880.95	6.356823	13112.78	1590.292	27351	333.1238	33.16529	0.290348
CC-117	86452.79	7.555341	12740.73	1521.835	26725.89	338.7764	29.81971	0.245916
CC-118	73035.3	9.65464	11709.41	1532.606	28148.97	322.4172	30.18128	0.252955
CC-119	76735.11	7.917063	11877.86	1384.101	24205.66	315.5414	32.25357	0.302027
CC-120	45095.88	10.30341	10952.26	1472.94	25570.56	298.0049		
CC-121	79646.34	6.046455	11124.01	1493.015	24611.42	304.1424	29.90173	0.283042
CC-122	80476.41	6.662237	9736.91	1460.066	25417.5	293.7037	27.55349	0.265898
CC-123	81709.51	7.394404	11504.04	1459.969	25028.69	325.3342	29.30056	0.289145
CC-124	79783.45	4.695127	10740.57	1434.951	26809.65	322.7691	30.79406	0.280769
CC-125	81222.48	8.125669	12209.91	1459.592	25860.36	315.4517	35.07309	0.318413
CC-126	78864.48	10.65498	7732.9	1320.986	32616.24	387.1809	26.75885	0.352194
CC-127	97415.81	11.19633	13480.9	1789.16	30854.23	294.8885	36.78516	0.446344
CC-128	92435.65	8.632887	7381.793	1304.281	21117.08	283.1762	37.10061	0.390752
CC-129	97894.48	10.50047	6588.605	1261.521	23276.24	249.9585	38.28006	0.324927
CC-130	91540.34	9.866747	7925.242	1334.33	21810.04	275.1864	39.97583	0.421289
CC-131	108468.5	10.12335	8616.281	1320.368	23023.53	286.1479		

QC

	AL	DY	MG	MN	TI	V	LA	LU
SRM688								
CC-031	101016.1	2.825837	12452.42	1215.91	8020.686	255.6643	5.563513	0.283881
CC-032	100989.9	3.507537	12301.81	1262.292	7838.44	269.3056	5.248613	0.294549
CC-033	115521.2	3.704997	13289.32	1248.813	7067.434	286.0812	5.572771	0.306033
CC-064						5.215789	0.312952	
CC-065	103703.9	2.385362	11921.95	1315.442	7108.434	261.2841	4.82207	0.284802
CC-066	100607	2.15747	12353.5	1330.427	7006.735	271.4283	5.144058	0.277501
CC-094	116158.9	3.39251	11742.84	1340.007	8463.45	266.2035	5.138048	0.289495
CC-095	97617.52	2.760939	10804.43	1217.626	6679.609	275.9203	5.519193	0.277632
CC-096	102081.1	4.510577	11821.35	1201.68	7352.922	269.534	4.951833	0.271289
CC-139	101563	5.588843	13303.71	1269.453	7724.994	270.8558	5.411406	0.314191
CC-140	99660.91	3.231594	10570.29	1267.651	7532.27	271.2144	4.832131	0.304062
CC-141	103798.3	2.612605	11054.76	1281.986	5906.693	256.1684	4.848625	0.270953
CC-144						5.460646	0.329407	
Average	103883.4	3.334388	11965.13	1268.299	7336.515	268.5145	5.2099	0.293596
Std	6158.064	1.002072	907.7686	46.45397	699.1855	8.726595	0.282419	0.018392
Lit	92500	3.3	52000	1250	7010	250	5.3	0.326

%Dev	12.30642	1.042069	76.99014	1.463905	4.657849	7.405815	1.700006	9.939868

	NA	SM	U	YB	BA	CE	CO	CR
	1368.6	103.2	106.1	396.3	496.3	145.4	1332.5	320.1
CC-001	29199.47	18.4009	0	3.385078	435.3067	142.1801	23.06413	2.937195
CC-002	30238.45	18.90152	0	3.251188	508.5854	145.7202	24.94925	4.998746
CC-003	29766.16	18.5079	0	3.428973	417.2514	134.9091	21.73787	2.116313
CC-004	30058.11	18.55928	0.651576	3.33476	457.9996	146.5024	23.35933	3.627162
CC-005	29712.71	19.10146	0	3.342706	403.3722	136.2843	25.07266	3.263485
CC-006	28533.12	13.31949	0	3.055132	328.0308	107.2594	25.27433	3.489964
CC-007	30356.88	19.28789	0	3.61252	396.1556	134.0175	21.99641	3.285466
CC-008	30125.08	19.43662	0	3.588037	443.8006	143.7087	23.48967	4.307479
CC-009	31319.73	19.28848	0	3.745633	458.7659	150.9633	25.06867	4.54178
CC-010	24761.87	10.96179	0.257598	2.271217	293.2602	100.2381	36.95605	16.51979
CC-011	14610.71	11.63332	0.368578	2.623456	268.8235	108.9211	64.10017	337.4838
CC-012	12402.5	9.421667	0	1.717105	0	74.31885	81.8833	591.9253
CC-013	25286.8	12.07934	0	3.363846	257.7065	88.82182	42.67126	3.428763
CC-014	27008.12	12.121	0	2.847466	298.0589	92.00388	32.68765	3.674627
CC-015	31161.84	19.50945	0	3.343776	408.4197	149.3101	25.28517	3.89807
CC-016	31443.7	19.73256	0.967628	3.626501	450.5158	149.5062	24.54627	3.940828
CC-017	13514.78	11.14645	0.5942	2.119899	167.1844	81.03845	64.59801	551.8755
CC-018	25937.71	11.56911	0	2.508283	175.7128	85.86127	40.27943	5.192998
CC-019	25636.3	11.99216	0	3.144974	311.6295	87.68416	41.14967	3.130262
CC-020	20174.15	10.66343	0	2.184925	245.0226	97.80603	58.85076	232.0717
CC-021	24648.34	11.90554	0.644844	2.837493	300.2084	82.7153	41.3642	3.084811
CC-022	19116.72	9.502242	0	2.360486	166.0094	73.64789	56.10158	277.5479
CC-023	30391.34	19.48109	0.861736	3.315315	518.4599	149.8602	25.432	3.90185
CC-024	30981.37	19.08468	0	3.368485	474.9502	145.246	23.72883	5.557553
CC-034	31404.15	18.9956	0	3.6598	477.9108	150.616	22.76936	2.952667
CC-035	14678.09	11.07581	0	2.145999	225.3274	84.09753	70.74014	563.582
CC-036	13518.49	10.57968	0	2.269496	207.1758	80.33744	67.75855	557.1868
CC-037	13513.61	10.77851	0	1.975132	167.9496	82.97491	68.76038	582.1734
CC-038	15112.3	10.53454	0.249785	1.857172	0	80.3767	64.14996	551.602
CC-039	19866.02	10.39429	1.034941	2.048427	291.9545	94.68869	58.92369	248.049
CC-040	14161.07	11.0147	0.555858	2.119423	289.8374	103.7773	59.99283	307.8555
CC-041	13961.99	10.88638	0	2.493233	256.487	101.3509	62.65161	321.7581
CC-042	19342.87	8.840748	0	2.005635	133.5588	57.87368	53.29784	37.09923
CC-043	11996.81	10.16639	0.437581	1.733832	201.0955	73.56636	69.44057	578.8215
CC-044	29927.86	17.34373	1.006079	3.604544	433.3476	122.6989	18.69197	3.697185
CC-045	24584.04	12.74304	0.736251	2.6394	230.445	82.94222	40.91256	0
CC-046	24886.31	12.09905	0.694786	2.354308	317.7334	85.77923	40.22913	5.130952
CC-047	25415.21	12.47699	0.597778	2.689116	285.4207	83.31442	40.14597	0
CC-048	18651.09	9.306715	0.286541	2.200069	0	65.95599	52.86447	189.3886
CC-049	18701.05	9.247489	0	2.079943	174.4149	63.26765	51.94731	189.4568
CC-050	26882.17	12.82996	1.167153	3.336539	270.6116	89.10969	42.53224	4.399657
CC-051	18024.96	10.27315	0.79551	2.2708	257.3328	72.05223	68.39408	314.0311

CC-052	25850.81	12.70565	0.791521	3.130159	246.6011	88.38203	43.6146	4.663336
CC-053	25947.26	13.07036	1.141562	3.171517	250.8473	90.30029	44.21777	0
CC-054	33908.7	19.57949	1.542786	4.302019	457.578	140.0495	22.44711	0
CC-055	28557.44	13.04473	0.984203	3.122092	303.8681	103.1396	31.77919	3.492517
CC-056	25958.35	13.2359	0.647508	2.756108	309.5251	101.1622	35.10423	4.242979
CC-057	27376.48	13.96136	1.031725	2.932555	262.7857	95.80492	33.66	3.934795
CC-067	24587.49	12.78789	0.750047	3.085312	249.5616	90.1824	44.69165	0
CC-068	13276.15	11.65551	0.63654	1.863387	153.7432	83.32155	68.74072	618.0334
CC-069	13951.56	11.89745	0.622743	2.024521	2647.415	125.2426	69.97584	578.1534
CC-070	25867.06	13.0529	1.087403	2.980425	903.8784	102.8321	33.66638	4.212313
CC-071	13439.78	11.09848	0.797541	1.977932	210.7575	76.15583	67.06172	584.4413
CC-072	24910.65	12.70905	1.019583	2.546968	302.0867	95.47955	34.79114	16.93548
CC-073	25516.21	12.66618	1.045335	2.878062	311.225	92.61046	34.30706	13.94941
CC-074	23113.55	11.87871	0.666647	2.719282	318.1669	83.80585	42.98438	0
CC-075	25529.57	11.56979	0.488485	2.648876	274.3127	82.58709	41.56105	5.377706
CC-076	25156	11.66713	0	3.010315	230.0975	89.66283	44.95229	4.273281
CC-077	24740.36	12.22709	0.273637	3.033844	193.5398	86.27882	38.7963	3.524925
CC-078	26559.63	12.86712	0.674727	2.972369	247.9091	94.42519	36.24028	3.220221
CC-079								
CC-080								
CC-081	19866.43	9.449458	0	2.681789	218.2499	58.10045	55.29804	37.64637
CC-082								
CC-083	16621.46	9.406565	0	2.419063	192.845	71.55801	62.17016	294.1416
CC-084	29069.55	13.54762	1.048989	3.20569	306.2478	102.0217	22.76605	0
CC-085	25525.04	11.69738	0.798484	2.521223	257.8371	81.26514	39.0282	5.093505
CC-086	25435.88	11.9462	0	3.006755	240.2609	80.68259	39.26578	4.452055
CC-087	24897.25	11.73004	0	3.055195	206.7436	82.17977	39.62033	3.399563
CC-097	25232.62	11.77477	0	3.131243	179.8662	81.71545	39.87281	2.667875
CC-098	24757.81	11.44045	0	2.816783	186.5465	80.34895	40.35036	0
CC-099	28576.02	13.31961	0.421626	2.880496	332.037	105.2639	21.73472	0
CC-101	23772.58	11.2112	0	2.705678	313.0788	82.40715	41.28437	4.398417
CC-102	24067.58	11.9718	0	3.060273	225.6983	91.60513	37.48481	3.535326
CC-103	18949.43	9.10491	0	2.080213	193.8003	68.02191	51.00409	160.3744
CC-104	24783.19	11.67583	0	2.788999	317.6387	86.11554	42.64004	3.163476
CC-105	25597.65	12.00501	0.351934	2.620086	277.7003	91.88774	33.32137	4.145367
CC-106	23860.77	11.48597	0	2.866578	270.5642	86.08032	42.17661	3.59232
CC-107	19122.6	9.116322	0	2.468118	108.0229	64.38038	50.71742	177.4149
CC-108	18908.75	9.325656	0	2.464545	172.8931	68.58477	53.83091	185.5357
CC-109	27953.35	13.75589	0.561453	3.10358	288.3249	85.53221	43.05325	2.00607
CC-110	21219.63	10.99344	0.454822	2.690176	230.0923	66.61551	52.70687	183.0046
CC-111	28479.19	14.33329	0.706022	3.394839	275.0773	87.815	42.99526	2.767298
CC-112	19691.03	11.01945	0.836006	2.459594	237.4109	78.35762	65.99161	313.1729
CC-113	21766.83	11.49883	0.689753	2.560077	229.2255	68.23551	62.28722	287.5325
CC-114	19494.87	10.5983	0.729994	2.172296	228.6248	74.39643	66.5227	316.5542
CC-115	20416.27	10.94598	0.720247	2.298051	258.9879	75.95863	67.20943	319.3154
CC-116	18518.16	9.875548	0.863675	2.149359	183.6648	71.7625	63.54815	311.8502
CC-117	18080.94	8.814538	0.732566	1.695288	206.3611	66.56675	61.78659	288.8904
CC-118	20016.28	8.957649	0.684065	1.939938	200.1333	70.51669	67.42869	312.2769

CC-119	19655.03	9.476642	0.731772	1.926409	223.284	76.30135	67.31987	312.2429
CC-120								
CC-121	18013.31	8.289683	0.582988	1.882301	212.5727	70.31712	68.04885	351.3544
CC-122	18058.35	8.329009	0.629652	1.728902	210.9953	70.28707	66.71048	315.1388
CC-123	18275.69	9.143585	0.75949	1.841527	194.3558	70.29709	66.56835	308.7051
CC-124	18824.54	8.919904	0.635185	2.01922	209.1637	70.21119	63.64265	300.5214
CC-125	19521.93	10.27342	0.834475	2.411594	183.7765	74.31853	64.58588	300.6114
CC-126	21805.96	10.17697	0.430642	2.695833	153.4111	63.3011	58.23244	42.56691
CC-127	13749.69	11.5249	0.836351	2.675245	799.0013	95.15926	91.21017	365.8615
CC-128	25076.64	11.90691	0.741084	2.892086	256.1072	88.71375	41.15694	2.463645
CC-129	26413.18	12.28338	0.75066	2.481446	255.2752	86.14866	42.37094	5.196433
CC-130	26996.03	13.19945	0.742931	3.196721	289.5706	92.59164	45.11144	2.117615
CC-131								

QC

	NA	SM	U	YB	BA	CE	CO	CR
SRM688								
CC-031	15221.49	2.515814		2.056687	0	10.86345	44.2812	302.7499
CC-032	15304.34	2.445746		1.994107	179.9969	12.20181	50.15377	339.6068
CC-033	15347.02	2.469787		1.925309	141.996	11.02464	47.34789	313.6185
CC-064	14900.38	2.315368		1.825452		11.15532	45.1595	304.5427
CC-065	14893.74	2.353149		1.841152		11.11955	49.27241	331.7593
CC-066	14994.48	2.317434		1.881672		11.73082	49.08754	339.7331
CC-094	14531.9	2.383538		2.118147		14.1965	50.8988	351.1476
CC-095	15603.69	2.502313		2.090357	214.6122	11.94541	50.34296	342.4735
CC-096	14030.28	2.243179		1.954435	113.3794	11.26704	46.17973	318.1515
CC-139	14350.72	2.349139	0.21119	2.019862	140.1076	13.30928	47.63377	310.4705
CC-140	13962	2.092438		1.870703		10.08974	45.76067	311.1589
CC-141	14809.2	2.161283		1.689664		12.47958	50.4105	339.311
CC-144	15273.32	2.451672		2.069305		12.48772	47.87753	330.7646
Average	14863.27	2.353912	0.21119	1.948989	131.682	11.83622	48.03125	325.8068
Std	514.3248	0.129456	#DIV/0!	0.124874	73.57208	1.106504	2.197178	16.29774
Lit	15800	2.4	0.32	2.03	198	12.5	48.3	321
%Dev	5.928647	1.920321	34.00309	3.990709	33.49393	5.31024	0.556415	1.497434

	EU	FE	HF	ND	RB	SC	SR	TA
	1408	1099.2	482.2	91.1	1076.6	889.3	514	1221.4
CC-001	6.106745	78972.98	12.12345	72.48608	65.82056	9.492764	1015.218	3.706467
CC-002	6.15508	77331.2	12.54347	74.99696	57.95436	9.444941	958.4336	3.705899
CC-003	5.924347	74183.71	11.67751	66.82858	58.75569	9.0959	951.6121	3.497606
CC-004	6.082158	80336.09	12.42507	72.75741	67.50923	9.635815	1047.155	3.802569
CC-005	6.05869	78771.51	11.86499	66.42175	55.04694	9.853324	1105.891	3.438039
CC-006	4.397612	83332.42	10.77216	47.74375	65.07982	12.07257	797.3042	3.271289
CC-007	6.023228	76764.12	11.72112	67.33497	62.87658	9.298337	1129.764	3.568086
CC-008	6.199016	80194.61	12.02427	84.54595	55.18703	9.727503	1167.586	3.528186
CC-009	6.52963	86526.61	12.73148	82.0271	65.20742	10.32125	1132.969	4.102418
CC-010	4.146263	99070.58	9.928337	44.41463	56.07719	15.05284	939.6152	3.207591
CC-011	3.88087	112405.3	10.02673	57.48985	36.13286	25.97336	773.9288	3.862222
CC-012	3.143632	113098.1	8.227596	33.40969	35.16711	25.898	456.6961	2.415318
CC-013	4.23427	100903	10.5738	42.13353	46.76439	16.34725	753.1971	3.100462
CC-014	4.057695	94362.54	9.642264	42.14461	40.53504	14.68653	816.6801	3.126842
CC-015	6.536861	85811.55	12.53373	82.57288	61.74409	10.28261	1142.132	3.871042
CC-016	6.391077	84839.7	12.42394	78.26178	53.32829	10.19714	1325.282	3.93627
CC-017	3.475309	102475.9	8.888924	40.60267	26.42873	27.16192	487.3072	2.613703
CC-018	3.892894	93564.09	9.23752	40.46404	44.70512	14.40456	834.5894	2.918268
CC-019	3.930819	95456.98	10.23537	41.69292	33.60893	15.96909	734.0016	2.882284
CC-020	3.591849	99893.07	8.68965	43.75721	36.14707	24.05021	624.8997	3.539814
CC-021	3.866898	96708.24	9.53541	39.45712	38.81764	15.51	580.2396	2.877917
CC-022	3.214922	99019.17	7.991401	36.95853	25.72401	23.45331	440.2286	2.819224
CC-023	6.336843	78793.29	12.29766	83.38428	64.02991	9.747572	1055.886	3.924471
CC-024	6.113536	78438.83	12.243	78.66418	64.95407	9.551234	972.359	3.810302
CC-034	6.243497	75757.22	12.18482	70.39261	71.70761	10.22235	1012.98	3.787745
CC-035	3.599632	106125.3	8.673491	40.52607	24.30204	27.4176	669.0164	2.514836
CC-036	3.407868	104052.5	8.587045	38.27196	17.9331	26.67619	726.7509	2.564422
CC-037	3.467274	107036.9	8.511235	37.56555	19.91205	27.46929	731.8218	2.541664
CC-038	3.446897	101341.9	8.419318	34.67425	23.96814	26.76676	528.9254	2.41527
CC-039	3.499813	101268	8.345556	39.171	35.74048	24.14993	615.7259	3.445897
CC-040	3.653443	104075	8.997103	39.47051	37.29438	24.519	566.0472	3.64349
CC-041	3.561614	105183.8	9.009502	39.37401	52.41588	24.28818	624.8371	3.580438
CC-042	3.027534	101774.9	7.393225	31.28209	25.13351	20.55879	455.2693	2.224532
CC-043	3.272888	103226.8	8.469276	36.7695	24.35167	26.75551	554.9539	2.8355
CC-044	5.420624	76236.61	11.53824	58.7895	61.38792	10.80116	880.9872	3.873356
CC-045	3.883284	94125.77	9.710682	32.36827	32.01001	15.27967	745.1248	2.731556
CC-046	3.853575	95112.59	9.319537	41.41198	27.85808	14.22068	757.8088	3.177064
CC-047	3.834321	94098.98	9.135014	39.51242	41.85068	15.40788	755.9893	2.789902
CC-048	3.235187	99633.1	7.557569	30.07203	27.73411	22.40127	523.6534	2.626101
CC-049	3.168899	97443.95	7.655436	34.5265	0	22.08738	479.3185	2.560101
CC-050	4.313705	100890.8	10.55626	42.01835	43.16238	16.18422	766.0744	2.920188

CC-051	3.376312	112244.1	7.750965	34.59369	34.15629	24.24579	452.6293	2.942508
CC-052	4.161497	102793.8	10.1436	44.16307	47.89625	16.04984	753.9764	2.889308
CC-053	4.266449	101013.1	10.61192	40.30979	48.29444	16.27935	713.6267	2.938481
CC-054	6.018501	80378.02	13.48845	61.9372	52.18863	11.82854	895.7693	4.061904
CC-055	4.290878	91747.23	10.04948	46.29956	56.31554	13.64657	782.147	3.155337
CC-056	4.804274	103193.5	9.732765	43.98663	36.27599	16.78721	969.6968	3.250441
CC-057	4.526302	100434.7	10.10765	41.4313	41.80294	15.51618	858.0385	3.101834
CC-067	4.25914	103609.7	10.71384	55.2282	32.65567	16.81488	862.2316	2.951753
CC-068	3.622807	106595.6	9.20599	50.37674	0	27.37682	673.7413	2.664624
CC-069	3.591143	107639.4	9.239691	76.34689	24.01174	27.44551	667.0919	2.661076
CC-070	4.089208	97300.55	9.473026	55.04979	34.64985	14.77359	839.7842	2.946146
CC-071	3.336131	102393.3	9.021733	45.74925	0	26.3771	633.1976	2.485138
CC-072	4.014773	92684.5	9.848649	57.60007	48.86872	14.42386	800.8886	2.974953
CC-073	3.981175	92851.98	9.734607	51.67693	54.65681	14.1588	855.2737	2.884548
CC-074	4.006831	99683.43	9.855816	44.41125	42.70695	16.03826	952.1643	2.660934
CC-075	3.912703	95718.49	8.608522	40.08456	38.03664	14.64945	956.0839	2.95019
CC-076	4.1783	103351.3	10.42268	42.60594	49.00788	16.66435	936.3126	3.030466
CC-077	4.300477	100814.8	10.19077	42.77837	50.56953	16.38135	788.5655	2.93433
CC-078	4.373005	98117.84	9.802886	41.46508	46.10716	15.09918	861.2481	3.138816
CC-079								
CC-080								
CC-081	3.240507	103964.1	7.676003	25.99423	35.18385	21.2332	630.9747	2.276943
CC-082								
CC-083	3.083394	104932.9	7.145996	33.459	30.48653	23.10442	678.0168	2.811004
CC-084	4.227826	78036.28	10.2284	45.22126	50.42922	11.12173	849.8165	3.26335
CC-085	3.697461	89581.55	8.997335	36.59039	38.39762	13.47208	731.6011	2.833441
CC-086	3.824326	90586.34	9.421786	39.67459	34.20473	14.75006	673.5971	2.796027
CC-087	3.820177	91995.05	9.578621	38.09274	35.04654	15.06861	786.8781	2.773134
CC-097	3.858637	92362.19	9.46042	39.86209	32.53059	15.13682	769.9994	2.78633
CC-098	3.840209	93623.23	9.13614	39.65729	33.6713	15.02689	661.2236	2.760625
CC-099	4.374002	77199.55	10.03171	46.94009	52.144	10.82297	771.4977	3.291605
CC-101	3.901484	93302.39	9.571911	38.74401	34.92735	15.14649	744.1194	2.731334
CC-102	4.261282	99055.2	9.86577	40.63643	43.96967	14.75581	787.069	2.861516
CC-103	3.403026	98711.48	8.091371	28.03483	17.50914	20.67694	597.9833	2.473996
CC-104	3.991588	97281.39	9.8705	40.91989	42.25085	15.42665	704.6623	2.939765
CC-105	4.12766	97469.83	9.015975	37.5797	35.67839	14.47142	797.4485	3.087228
CC-106	3.999908	97437.52	9.956028	37.39196	48.49565	15.35285	788.1232	3.012879
CC-107	3.130892	95695.09	7.842984	28.54499	24.75963	20.95965	509.2113	2.231396
CC-108	3.318369	101196.3	8.36455	30.578	25.8689	22.00256	552.5688	2.425951
CC-109	4.085838	99452.07	9.715687	41.19012	34.70388	15.96726	795.9017	2.751676
CC-110	3.284422	100021.9	7.995685	29.16309	36.96467	21.98535	812.3544	2.317047
CC-111	4.114266	100063.3	10.19811	49.69173	39.47275	15.96471	737.6083	2.826224
CC-112	3.237886	111663.4	7.677964	39.35881	26.26896	24.83753	560.2624	2.821194
CC-113	2.959737	106373.1	7.145879	29.4047	26.46249	23.04383	437.9259	2.532209
CC-114	3.080278	112174.2	7.731126	38.16689	20.36786	24.26233	606.0587	2.983292
CC-115	3.185747	113982.5	7.742921	38.98586	21.20053	24.87629	546.9075	2.821699
CC-116	3.060717	107524.1	7.104558	42.33852	0	23.14844	679.7455	2.73728
CC-117	2.889231	103405.5	7.512763	26.00622	0	23.04315	490.3443	2.741507

CC-118	2.866014	110836.5	7.743398	28.82848	23.97902	24.80436	502.0467	3.01152
CC-119	3.291852	112597	7.852184	32.19415	25.01928	24.66434	755.7585	2.971189
CC-120								
CC-121	2.913129	111545.9	7.389462	28.64658	23.16731	24.28678	488.2046	3.132256
CC-122	2.926621	112673.7	8.10867	32.08515	25.13581	24.61962	619.2629	2.947937
CC-123	2.995198	108840.5	7.656211	39.59673	21.97371	24.3637	455.1479	2.975565
CC-124	2.93705	107016.7	7.381125	29.01725	25.88559	24.21356	439.6356	2.919545
CC-125	3.241603	108270.9	7.658918	38.83492	33.78796	23.94855	548.3354	2.937514
CC-126	3.259534	109795.6	8.345888	29.58889	32.5464	22.32169	591.5155	2.456928
CC-127	3.989516	131796.1	9.136546	33.66081	52.96101	28.82621	762.8	3.618155
CC-128	3.996854	96369.25	10.75167	37.43698	40.00865	15.72476	739.2758	3.093953
CC-129	4.024963	97581.51	9.379679	39.43037	31.40975	14.8334	870.1573	3.27077
CC-130	4.204051	102125.6	10.67619	37.42933	45.3536	16.56661	729.8466	3.094014
CC-131								

QC

	EU	FE	HF	ND	RB	SC	SR	TA
SRM688								
CC-031	0.990208	66491.26	1.386479	4.394807		34.39777	0	0.30275
CC-032	1.068905	74980.28	1.796489	0		38.3391	0	0.233467
CC-033	0.963874	69968.62	1.665603	5.62829		36.59113	107.0616	0.228147
CC-064	0.975725	67801.44	1.515626	4.711688		35.30507	131.5584	0.326483
CC-065	0.912615	73719.86	1.550993	4.810025		37.93362	0	0.359632
CC-066	0.967936	74367.07	1.807311	0		37.72511	0	0.447833
CC-094	0.9537	76317.5	1.885618	0		39.06719	144.9655	0.26757
CC-095	1.002354	75106.13	1.555636	6.11082		37.9904	129.199	0.228143
CC-096	0.987649	68548	1.335219	5.348275		35.40476	0	0.278425
CC-139	1.032992	70323.94	1.558561	0		35.26876	0	0.283788
CC-140	0.937169	68947.3	1.434388	4.889271		35.00913	0	0
CC-141	1.00241	74818.07	1.72953	5.980929		37.58656	212.9293	0.284153
CC-144	0.976142	71732.74	1.597362	7.305697		35.84785	139.1247	0.27041
Average	0.982437	71778.63	1.601447	3.783062	#DIV/0!	36.65127	66.52604	0.270062
Std	0.04011	3281.931	0.168463	2.727544	#DIV/0!	1.523494	78.33553	0.100882
Lit	1	71600	1.55	8.9		36.6	169	0.31
%Dev	1.756326	0.249485	3.319181	57.49369	#DIV/0!	0.140069	60.63548	12.88333

	TB	TH	ZN	ZR
	879.4	312	1115.6	756.7
CC-001	2.379849	5.597648	201.4544	518.1556
CC-002	2.345895	6.055476	204.5921	558.6352
CC-003	2.261148	5.361262	199.1632	412.3012
CC-004	2.347318	6.189026	216.7221	451.8168
CC-005	2.287019	5.127935	205.3941	444.1575
CC-006	1.810871	5.227679	170.9586	402.6433
CC-007	2.225167	5.216552	198.1586	428.6299
CC-008	2.488014	5.326668	212.133	458.643
CC-009	2.859372	5.853548	217.018	457.7479
CC-010	1.672043	4.745563	186.5466	280.4164
CC-011	1.658536	5.506647	175.5837	385.8981
CC-012	1.23085	3.242436	161.7913	309.7553
CC-013	1.919766	3.845467	182.0674	344.0086
CC-014	1.862155	4.490058	193.5259	360.2938
CC-015	2.877286	5.41068	224.5673	446.5267
CC-016	2.667486	5.619198	220.0476	464.2542
CC-017	1.291724	3.686568	153.1107	251.9633
CC-018	1.585989	3.936707	162.5914	286.7445
CC-019	1.624584	3.730869	166.4738	420.9447
CC-020	1.335066	5.058875	162.5293	241.1271
CC-021	1.680637	3.575898	160.378	266.3501
CC-022	1.350807	3.702801	164.4255	239.7509
CC-023	2.350996	5.987803	206.7906	433.3284
CC-024	2.233444	5.889345	189.7218	421.2996
CC-034	2.38383	6.021388	220.2111	323.4703
CC-035	1.231737	3.606648	155.5691	214.1538
CC-036	1.249818	3.636852	155.6258	267.4373
CC-037	1.010037	3.557217	152.8991	200.9551
CC-038	1.149072	3.534621	147.4638	209.6579
CC-039	1.180642	5.002973	155.0211	223.8258
CC-040	1.343545	5.478446	162.9812	281.2287
CC-041	1.292991	5.120637	157.5371	254.386
CC-042	1.292059	2.510459	140.2869	0
CC-043	1.338396	3.162388	153.7817	272.141
CC-044	2.564658	5.485554	185.094	368.7362
CC-045	1.808295	3.822099	159.9636	348.1689
CC-046	1.857851	4.091522	162.8633	311.7797
CC-047	1.725658	3.656713	143.5947	412.2213
CC-048	1.463293	2.844485	155.7157	299.2099
CC-049	1.370951	2.891901	155.5075	266.433
CC-050	1.814348	3.977823	180.5708	290.2871

CC-051	1.356598	3.588419	181.1071	198.6959
CC-052	1.972244	3.748515	197.6555	330.3928
CC-053	2.095153	4.000379	166.1842	352.1309
CC-054	2.504614	6.062084	218.4526	509.1816
CC-055	1.99962	4.832191	159.6502	341.1017
CC-056	2.038639	4.143821	194.5506	259.446
CC-057	1.963175	4.451124	192.0547	358.0305
CC-067	1.981482	3.838526	175.0821	338.8741
CC-068	1.342659	3.709165	174.5431	257.1024
CC-069	1.585487	3.802303	167.6565	1696.645
CC-070	1.800858	4.174416	187.4016	564.486
CC-071	1.546209	3.734035	147.0689	177.1871
CC-072	1.980776	4.759302	216.885	323.6638
CC-073	1.746575	4.498897	209.7224	302.3101
CC-074	1.822697	3.469968	190.2271	274.116
CC-075	1.610657	3.626825	175.6121	249.7465
CC-076	1.675522	3.795118	174.131	328.2648
CC-077	1.787155	3.753714	177.1937	331.4354
CC-078	1.864342	3.941328	184.2276	362.7451
CC-079				
CC-080				
CC-081	1.293163	2.444344	144.5602	227.6377
CC-082				
CC-083	1.141047	3.460074	152.6013	225.6586
CC-084	1.823239	5.274239	166.3156	316.9968
CC-085	1.56633	3.849678	174.217	287.0617
CC-086	1.631278	3.619297	149.806	228.4224
CC-087	1.66132	3.487596	155.564	383.3518
CC-097	1.616764	3.503755	158.305	372.2907
CC-098	1.676618	3.306147	164.6263	328.7204
CC-099	1.717304	5.014947	144.3212	340.1628
CC-101	1.577306	3.486455	183.5461	381.9608
CC-102	1.698103	3.983866	178.2044	326.397
CC-103	1.433894	2.854455	151.1009	211.0857
CC-104	1.811483	3.671861	175.6187	270.0064
CC-105	1.70602	4.320512	166.4715	314.5657
CC-106	1.812702	3.737328	171.2112	327.2586
CC-107	1.313771	2.665028	147.8823	221.7353
CC-108	1.364971	2.936228	153.1585	233.4655
CC-109	1.818132	3.509944	173.5588	293.9519
CC-110	1.507187	2.870063	158.3771	250.321
CC-111	1.893901	3.865406	170.4166	332.3805
CC-112	1.346992	3.810625	159.9578	174.4421
CC-113	1.231223	3.487721	151.8132	208.9385
CC-114	1.291951	3.861022	153.1364	155.8788
CC-115	1.432387	3.771139	164.5195	195.9605
CC-116	1.233892	3.613199	153.5807	188.5811
CC-117	1.119596	3.372885	149.8619	197.8624

CC-118	1.117665	3.480145	149.1115	221.8273
CC-119	1.192011	3.903753	158.4262	214.8884
CC-120				
CC-121	1.0862	3.515148	145.8461	219.2608
CC-122	1.07899	3.728909	148.9819	207.4595
CC-123	1.246488	3.29695	155.1562	185.398
CC-124	1.22253	3.451305	141.2	176.0519
CC-125	1.394871	3.658575	135.867	269.4578
CC-126	1.449106	2.708696	144.7442	334.811
CC-127	1.917536	4.270481	230.2052	285.757
CC-128	1.759234	4.070329	165.4614	391.7025
CC-129	1.764039	3.698671	161.4139	333.9911
CC-130	1.799072	3.788075	186.8933	316.7025
CC-131				

QC

	TB	TH	ZN	ZR
SRM688				
CC-031	0.337591	0	81.43079	
CC-032	0.474366	0.390982	78.56486	
CC-033	0.361493	0.244986	78.70376	
CC-064	0.648954	0.243729	71.77024	
CC-065	0	0	81.46671	
CC-066	0.518861	0.453058	95.63243	
CC-094	0.640805	0	82.94825	
CC-095	0.911489	0.296146	78.37016	
CC-096	0.454971	0.328995	90.76617	
CC-139	0.492706	0.297724	81.31581	
CC-140	0.411506	0	69.63732	
CC-141	0.875592	0.239067	82.49413	
CC-144	0.855352	0.253576	78.25437	
Average	0.537207	0.211405	80.87346	#DIV/0!
Std	0.252846	0.158794	6.805422	#DIV/0!
Lit	0.52	0.32	81	59
%Dev	3.308944	33.93604	0.15622	#DIV/0!

VITA

Name:	Christopher Thomas Crews
Address:	Texas A&M University 234 Anthropology Building College Station, TX 77843
Email Address:	ctcrews@yahoo.com

Education:	B.A., Drama and Dance, Colorado College 1999